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EDITORIALS

SPREADING KNOWLEDGE OF ELECTRICAL REQUIREMENTS.

In the early days of the electrical industry when no one knew very much about electrical matters, the little knowledge that was possessed, being mostly acquired from experience, was jealously guarded for fear that it might aid competitors. As the industry developed and there grew up in it societies like the American Institute of Electrical Engineers and the National Electric Light Association, interchange of ideas and discussions of electrical matters became more common and these greatly stimulated the extraordinary electrical developments of the last quarter century.

In recent years most branches of the industry have shown a tendency to practice co-operation, at least to the extent of minimizing the evil effects of competition in business. We now have two strong national electrical organizations, the Jovian Order and the Society for Electrical Development, which are carrying out active propaganda for co-operation. The national house-wiring campaign about to be inaugurated by the latter society is an instance in point.

Another case is the compiling of a condensed and yet complete analysis of the changes in the National Electrical Code that are incorporated in the recently issued 1915 edition. This analysis is published on other pages in this issue. For it the industry is indebted to Mr. Washington Devereux and his corps of electrical inspectors. It would seem that such an analysis of changes could be easily compiled by the Electrical Committee which has charge of the biennial revision of the Code and published either as an appendix or as a separate supplement to the revised edition of the Code procurable for the small cost of publication. It would be still better to publish a larger pamphlet giving an authoritative and less condensed explanation of each of the changes, so that the electrical contractor and inspector could have readily available promptly and in easily understood language the significance of each change. This would promote not only a better and more up-to-date knowledge of the National Electrical Code but would eliminate the numerous unintentional violations of it caused by failure to grasp its meaning.

To show the importance and value of this matter to the electrical construction industry and the co-operative spirit shown in at least one city to keep the industry informed, it may be stated that Mr. Devereux is planning to distribute the information referred to in a new edition of his "Electrical Key," which is supplied to all electrical contractors, electricians and electrical mechanics in Philadelphia. Surely the "City of Brotherly Love" is setting a splendid example in this matter and one that might be copied with profit.

TEN YEARS OF ILLUMINATING ENGINEERING.

The midwinter convention of the Illuminating Engineering Society, held last week in New York City, marked the tenth anniversary of the formation of that society. When the founders of the society gathered together in 1906 to form an organization, illuminating engineering as an applied science and an art was in its infancy. Lighting installations were put in without much study of the situation and were considered satisfactory if they supplied enough illumination to accomplish the primary purpose of seeing.

Ten years have witnessed great advances in illuminating engineering, and with many of these the Illuminating Engineering Society has been identified. The society has stimulated study and research in the problems of illumination, and has furnished a medium for bringing the results to those who are in a position to utilize them in practical lighting work. It has furnished the forum where engineers and commercial representatives could come together to discuss their problems. It has brought to the attention of scientists problems requiring extended research for solution, and many of these have been taken up in the laboratories where alone the facilities for their solution are available. Under the successive presidencies of L. B. Marks, Clayton H. Sharp, Louis Bell, W. H. Gartley, Edward P. Hyde, Arthur E. Kennelly, V. R. Lansingh, Preston S. Millar, C. O. Bond and A. S. McAllister, it has held a series of annual conventions whose transactions represent the developing thought and knowledge of the subject. In conjunction with Johns Hopkins University, it arranged a course of lectures in 1910 which served to collect and render available such information as could then be gathered together on the subject. Under the presidency of Dr. Charles P. Steinmetz, it is proposed to arrange a similar course of lectures in connection with the convention to be held this year in Philadelphia, and with Dr. Hyde heading the committee in charge, it may be confidently expected that this will be as completely successful as the previous effort of the same kind.

The society had a large part in bringing about the adoption of the international candle as a unit of luminous intensity. By its publication of a lighting primer it has helped to bring to public attention some fundamental facts connected with the proper use and the misuse of light. Its various committees have advanced the situation with respect to glare from paper, lighting of school houses, lighting legislation, etc. The society has already accomplished much in the vigor of youth with an undeveloped field before it, and may look forward hopefully to valuable work in the future.

In signalizing the tenth anniversary of its birth, the society could have selected no one more appropriate as the recipient of honorary membership than Thomas A. Edison. His work has contributed more than that of any other man to the progress of electric lighting, and the application of electric illuminants is almost synonymous with modern illuminating engineering. Mr. Edison not only invented the first commercial electric incandescent lamp, but developed many of the elements necessary for a complete multiple system of lighting. Since the dinner at which the presentation of honorary membership took place was continued until after midnight, it became also a birthday party for Mr. Edison, who, in spite of his continued activities, was credited with 69 years of life on February 11. As the foremost inventor of the world, Mr. Edison takes a deserved position as honorary member of the society.

SECURING EFFECTIVENESS IN ILLUMINATION.

An element was injected into the midwinter convention of the Society which has been too often lacking and which is decidedly needed to balance the usual number of laboratory and commercial papers, which ordinarily make up the bulk of the program. The papers by Prof. Morgan Brooks and Mr. Bassett Jones represented studies to determine how to best make use of the facilities available to the engineer to obtain effective results, and to so illuminate the object of his work, whether it be persons or building interiors, or indeed exterior areas and structures, as to give pleasing results and to attain the end for which it is to be made visible. This touches upon the artistic side and requires the artist's eye and the artist's imagination for its proper consummation, but it is nevertheless an appropriate field for the illuminating engineer.

The paper by Mr. Jones dealt with stage lighting and showed how big a field exists for the application of sound engineering to this work. Just as the architect has often left the lighting of his creations to be carried out by a routine giving no consideration to what he would wish to have brought out, so the playwright and the stage manager have left their productions to the mercy of the stage electrician, whose principal efforts have been devoted to producing volume of light and wealth of color. To give the proper proportion of illumination to the different portions of the stage, to the properties and actors, to throw the shadows in the right direction, to emphasize the essentials, to display facial expression, to give an atmosphere in sympathy with the words and actions of the play, requires both art and engineering; and these have been generally lacking in both the planning and the execution.

The paper of Professor Brooks dealt with architectural interiors in much the same way, pointing out the needs and the neglected possibilities—for we must admit that they *are* generally neglected. Here again an appropriate atmosphere is necessary for effectiveness, emphasis must be put in the right place, intensities must be properly graded, and shadows must be controlled. The varied apparatus of the stage is not available, yet much can be done by a proper selection and arrangement of lighting units and illumination intensities. The apparent dimensions of a room may be altered, pleasing contrasts brought about, coziness suggested, etc. Two methods suggested by Professor Brooks for changing the distribution of light are novel. One is to groove the ceiling, an effect which could be easily secured if found worth while for indirect lighting. The other is the use of direct or semi-direct glassware of elliptical or unsymmetrical rather than circular section. This would probably prove expensive to manufacture, and the desired results could usually be secured in other ways. The need exists, however, for unsymmetrical distribution of light in certain cases, and departures from the stereotyped symmetry of the typical installation would be welcomed by the artistic eye.

NATIONAL RECOGNITION FOR ENGINEERS.

There has been much talk among engineers of the lack of recognition by the public of the important place which the engineer occupies in the complex activities of modern life. Nearly every convenience enjoyed by the individual in the city, and nearly every industrial operation is dependent upon the work of the engineer. Yet in choosing legislative and administrative government officials, in organizing big transportation or industrial corporations, and in filling other posts of importance and responsibility, little attention is given to the engineer. He is seldom a leader of public opinion. Only when it comes time to actually begin work which only he can do is he called in to perform it.

The real dependence of the nation upon the engineer, and the need of his counsel and mental resources in high places has been keenly felt in England since the outbreak of war, and is being realized in this country in taking steps for preparedness. The Naval Consulting Board was the first evidence of this, its membership calling for engineers, chemists and other inventors. We now find the President of the United States again calling upon the engineers of the country for assistance in organizing industrial plants so that they shall be ready upon call to begin the manufacture of munitions without delay. As before, the national engineering societies constitute the medium through which the appeal is made. For the American Institute of Electrical Engineers, President Carty lost no time in responding, and a representative will be appointed in each state to cooperate with others representing other engineering and chemical interests. These groups will then proceed to organize their respective territories.

That this call should come to the engineers is an evidence that their genius for accomplishing things is not unappreciated in Washington. It is at once an honor, a duty, and a recognition that is put upon the shoulders of the organized engineers of the country and we have no doubt as to how they will meet the emergency. It was Mr. Carty who once said that engineers

can accomplish any material feat if some one stands ready to foot the bill! The requirements of this work will not even tax their abilities.

THE MEASUREMENT OF MAXIMUM VOLTAGE.

One of the sessions of the recent midwinter convention of the American Institute of Electrical Engineers was devoted to the measurement of alternating voltage. For a high voltage the classical method of measurement has been to use a spark gap, whose indication gives the maximum or crest value of the voltage wave. If the wave form be known it is also a measure of the effective or root-mean-square value. In many cases of high-voltage work, such as the testing of insulation, the crest value is the important element of the voltage, and the measurement by spark gap provides directly the desired quantity. There are, however, disadvantages inherent in this method. It gives no indication except at the moment of breakdown, and this breakdown may itself alter conditions in the circuit and set up objectionable oscillations. The gap must be set for each reading, and the convenient features of an indicating instrument are all lacking. Corrections are necessary for barometric pressure, etc.

Of recent years numerous attempts have been made to devise methods for directly indicating the crest value of an alternating voltage, and several of these have proven satisfactory in practice. One early scheme was to use an impulse transformer, whose secondary current was inappreciable except at the maximum of the primary wave, to supply one coil of an electrodynamometer. A more practical method was the adaptation, by Messrs. Middleton and Dawes, of the oscillograph to measure the maximum value instead of describing the curve to represent the entire wave. Mr. Dawes has lately applied this principle to an electrostatic oscillograph, thus obviating the necessity for the comparatively large current required by the oscillograph of the Duddell type. Messrs. Sharp and Farmer some years ago described a method in which an instantaneous contact apparatus driven by a synchronous motor made connection to an electrostatic voltmeter at the instant of maximum voltage. Messrs. Chubb and Fortescue made connection during a half cycle to an ammeter connected in series with a condenser. The charging current was then a measure of the maximum voltage. Professor Whitehead used a mercury rectifier with this arrangement.

The phenomenon of corona, after the necessary constants are known, offers a means of measuring voltages above a certain range. With a direct-current discharge, the air pressure due to ionization serves as a measure of steady voltage, but with alternating voltages dependence must be placed upon the observation of corona itself.

Since the minimum voltage at which corona will take place depends on the diameter of the discharging wire, the air pressure, etc., there is a certain range in which corona may be made a measure of voltage. Prof. H. J. Ryan uses a rod of conical form. Detection of the corona may be made by electroscope, galvanometer, telephone or mere visual observation.

Two new modifications of old methods were brought forward for consideration at the Institute meeting, and both make use of the kenotron, or vacuum tube with a hot cathode, as a valve, to permit current to flow into an instrument in one direction only. Messrs. Sharp and Doyle connect in series with this valve an electrostatic voltmeter, which thus becomes charged to the maximum voltage of the wave, which is indicated by its reading. Mr. Chubb connects the valve in series with a condenser and a direct-current ammeter, and again the charging current is a measure of the crest voltage. In this case the current will depend upon the frequency, which must be known and allowed for. By using as his condenser the bushing of a high-voltage terminal, Mr. Chubb is unlimited in the value of voltage to which his method may be applied. However, where any of the methods require a low voltage, high voltages can be measured by the use of a transformer or of a test coil suitably located in the transformer which produces the high voltage.

The method of Messrs. Sharp and Doyle seems to present possibilities of application to a single wave or surge, and if so it will prove doubly valuable, as other means for such measurements are not satisfactory.

A NEW RECORD IN ELECTRICAL EXPORTS.

The peculiar condition of international commerce brought about by the European war has formed the subject of much discussion in commercial circles and a variety of opinions, or rather conjectures, have been expressed on the probable status of foreign trade after the conclusion of peace. Nearly all of the leading neutral nations have experienced a decided stimulus in their foreign commerce and whether this is to be permanent or temporary no one can say. The extraordinary increase in American exports since the war began, starting with heavy shipments of food stuffs, is being reflected in an ever widening group of our products, of which the electrical exports are now experiencing their share.

As given on another page of this issue, the latest official monthly report shows that the electrical shipments for last November broke all previous monthly records, exceeding the high value of May, 1913, by over seven per cent. As compared with November of 1914, there was an increase of nearly 67 per cent. The chief contributors to this increase are batteries, wire, lamps and the miscellaneous, or "all other," class; the latter mysterious group was about double in value. The total value of the electrical shipments for the first eleven months of 1915 indicate that the aggregate for the year will not quite reach the high total established in 1913, but will come a close second thereto.

Such achievements in view of the troublesome conditions abroad should prove encouraging to the electrical industry. That much greater achievements in foreign electrical trade could be attained, however, is evident when one considers with what apathy the subject of export trade is still looked upon by some.

Happenings in the Industry

Electrical Exports Reach High Mark in November—Important Electric-Range Topics Considered by Committee of Commercial Section—Edison Made Honorary Member of Illuminating Engineering Society at New York Convention—Important Utility Merger in Massachusetts—Dr. Louis Duncan Dies in New York

Electrical Exports for November Break All Previous Records.

From the monthly summary of the foreign commerce of the United States just issued for last November by the Bureau of Foreign and Domestic Commerce, Washington, D. C., it is evident that the total value of the electrical exports for that month broke all previous monthly records. The November total exceeded that of a year ago by nearly 67 per cent. For the four electrical classes for which quantities shipped are given in the government reports, there were exported last November the following: Electric fans, 3,943; arc lamps, 114; carbon-filament lamps, 121,672; metal-filament lamps, 658,005.

The classified electrical figures for the month and for the corresponding period of a year ago are reported as follows:

Articles.	Nov., 1915.	Nov., 1914.
Batteries	$ 184,903	$ 44,136
Dynamos or generators	58,850	112,784
Fans	55,849	3,525
Insulated wires and cables	302,089	78,652
Interior wiring supplies, etc. (including fixtures)	79,580	53,189
Lamps—		
Arc	2,115	860
Carbon-filament	13,186	5,408
Metal-filament	98,703	22,379
Meters and other measuring instruments	85,113	32,061
Motors	293,540	337,792
Telegraph instruments (including wireless apparatus)	12,154	3,350
Telephones	30,308	143,777
Transformers	170,632	115,955
All other	1,357,825	690,555
Total	$2,744,847	$1,644,723

Meeting of the Range Committee of the Commercial Section at Salt Lake City.

Pursuant to a call by the chairman, W. R. Putnam, sales manager of the Utah Power & Light Company, the Electric Range Committee of the Commercial Section of the N. E. L. A. convened at Salt Lake City, February 7, for a three-day session. The following members of the committee were in attendance: S. M. Kennedy, general agent of the Southern California Edison Company, Los Angeles; M. C. Osborn, commercial agent, Washington Water Power Company, Spokane; S. V. Walton, commercial manager, Pacific Gas & Electric Company, San Francisco; A. C. MacMicken, commercial manager, Portland Railroad, Light & Power Company, Portland, Oregon.

The purpose of the meeting was to receive a report of progress from the various sub-committees, to decide upon the further investigations to be made and to lay out in a preliminary way, the report of the committee to be presented at the coming convention.

Extended conferences of the committee were held with the manufacturers' representatives at which the various features of development of the range business were discussed and lines of procedure agreed upon. The various chairmen had secured information from practically all of the important central stations in the western section of the country and it was the consensus of opinion of the committee that the central stations of the country are well prepared now to develop the range business, both as to merchandising and rates, and that this condition is not alone confined to the Western States, but is quite general throughout the country. It was felt that with these conditions obtaining the rapidity with which the range business would develop would depend to quite a large extent on the co-operation which could be effected in a nation-wide educational campaign as to the advantages of electric cooking. It was the opinion of the committee that in such a campaign, comparative costs should be avoided as far as possible, and the educational efforts be concentrated on the advantages of electric cooking. It was pointed out by various members of the committee that this situation presented an unusual opportunity to the Society for Electrical Development, to take the leadership in this educational propaganda. Housekeeping magazines, farm journals, newspapers and magazines of general circulation are fully awake to the fact that electric cooking is a live subject, and that their readers are anxious to obtain information on it. A large amount of publicity can be secured if the local advertising of the central station can be supplemented by a nation-wide advertising campaign by the manufacturers. At the convention of the Northwest Section, the Range Committee stated that in its judgment, 5,000 ranges could be sold in that territory. More optimistic members of the committee which included Chairman Putman, predicted, however, that the number would probably exceed 10,000 ranges. It developed at this meeting that the range sales for 1915 had exceeded that number, and the prediction for 1916 ranged from 20,000 to 30,000 ranges, depending, as previously stated, upon the extent to which the public can be educated to the advantages of electric cooking by the educational campaign, which it is hoped by the committee, can be organized and effected.

It is the intention of the committee to make its report at the coming convention a compendium of information on electric cooking available today. The committee's report at the Portland convention of the Northwest Section was so comprehensive that it will not be practicable to submit a report along entirely new lines. The important features of this report will be summarized and the additional information and development since this report given so that any central-station man unfamiliar with the subject will be able to get as complete review of the subject as is possible in a committee report.

Philadelphia Electric Company Section Activities.

The first meeting of the year of Philadelphia Electric Company Section, N. E. L. A., was held in Lulu Temple January 17, and the speaker of the evening was Edward James Cattell, city statistician. He chose as his theme "The Way to Happiness."

A splendid vaudeville program followed Mr. Cattell's address. The floor was then cleared and dancing followed.

The meeting of the Meter Department Branch on January 7 was addressed by Samuel J. Cooper, Jr., and Herbert S. Bauman. Mr. Cooper spoke on motors and motor troubles and demonstrated the effects of various troubles, such as running on one phase, incorrect starting taps, etc., by reproducing these conditions. Mr. Bauman gave a résumé of the types and characteristics of modern graphic instruments and sketched their application to the electrical industry.

The Commercial Branch held a combination dinner and meeting at the Arcadia Cafe on Monday evening, January 24. The speakers were Philip Moore, W. M. Stevens and S. S. Neff.

EDISON MADE HONORARY MEMBER OF ILLUMINATING ENGINEERING SOCIETY.

Midwinter Convention Held in New York.

Conferring honorary membership upon Thomas Alva Edison was the feature of the midwinter convention of the Illuminating Engineering Society, held in New York City on February 10 and 11 to celebrate the tenth anniversary of the founding of the Society. This ceremony took place at a banquet at the Hotel Biltmore on Thursday evening, February 10, in the presence of over 400 guests, and the presentation was made by John W. Lieb after reading an address recounting Mr. Edison's achievements. This was preceded by an address by President Charles P. Steinmetz and followed by another by T. C. Martin. William H. Meadowcroft responded on behalf of Mr. Edison.

Others seated at the speakers' table were Arthur Williams, William Williams, E. H. Johnson, Hugo Münsterberg, F. Park Lewis, A. E. Kennelly, M. R. Hutchison, William E. McKay, D. S. Jacobus, Farley Osgood, Haley Fisk and Charles R. Lamb.

Among those present at the banquet were: Louis Bell, Charles O. Bond, H. H. Cudmore, S. E. Doane, Mrs. Edison, H. M. Edwards and Mrs. Edwards, Louis A. Ferguson and Mrs. Ferguson, Frank H. Gale, S. B. Gorge, A. S. McAllister, Ray Palmer, E. W. Rice, Jr., W. D' A. Ryan, Edward Schildhauer and Mrs. Schildhauer, Frank W. Smith and Mrs. Smith, Theodore Stave, Calvert Townley, J. M. Wakeman and Mrs. Wakeman, W. R. Whitney, L. Zelander and Mrs. Zelander, of Amsterdam.

The sessions of the convention were held in the Engineering Societies Building. At the opening session on Thursday morning Arthur Williams presided and an address of welcome was made by Mayor John P. Mitchel. A. E. Kennelly responded to this and was followed by Charles P. Steinmetz, whose presidental address was on the topic "Illuminating Engineering."

L. B. Marks, one of the founders of the Society and now its treasurer, spoke on the subject "The Tenth Anniversary of the Society," and pointed out what had been accomplished by it, and what had been the concurrent development of the art of lighting.

Other addresses were made by Hugo Münsterberg, psychologist; Charles Rowland Lamb, architect; and F. Park Lewis, physiologist. Professor Münsterberg told of researches being conducted to determine the effect of colored light upon mental processes. Many problems in lighting, such as safety in street illumination, can be settled better by psychological studies than upon the basis of physics or common sense.

Three other sessions were devoted to the presentation of technical papers. President Steinmetz presided at the session on Thursday afternoon. The first paper was by Bassett Jones and was entitled "The Possibilities of Stage Lighting Together With an Account of Several Recent Productions." The author showed the need of applying both engineering and artistic principles to get the best stage effects. This paper was discussed by Messrs. Luckiesh and Irwin.

A paper by Morgan Brooks, entitled "The Relation of Lighting to Architectural Interiors," was read by A. L. Powell, and discussed by J. R. Cravath, S. E. Doane, Norman Macbeth and Felmer Moon.

W. E. Hodge presented a paper on "Simple Methods of Computing Light Flux and Horizontal Illumination," by himself and R. W. Chadbourne. The method uses the vertical distribution curve and unit dimensions. Special curves are drawn for horizontal illumination. This paper was discussed by F. A. Benford.

At the session on Friday morning a paper by Thomas Scofield and Clarence L. Law entitled "Lighting of the General Offices of The Consolidated Gas and The New York Edison Companies, Consolidated Gas Building, New York City," was presented by Mr. Scofield. This building is lighted by semi-direct fixtures, and a description was given, with measurements of the resulting intensities of illumination. The paper was discussed by J. D. Israel, George A. Hoadley, R. F. Pierce, R. B. Ely, T. J. Litle, Jr., J. R. Cravath, Ward Harrison, D. McFarlan Moore, Preston S. Millar, F. M. Steadman, W. R. Moulton and H. R. Summerhayes. The discussion turned largely upon the question of whether a lighting company should install in its own offices a variety of lighting systems to demonstrate the possibilities of different systems, and opinion was divided upon this point. In closing Mr. Scofield stated that the rooms were lighted for use rather than display, and separate display rooms are equipped for showing fixtures and illustrating different types of lighting.

James D. Lee, Jr., read a paper entitled "Gas Lighting in a Cathedral," which described the installation in the cathedral of Saints Peter and Paul, Philadelphia. It was discussed by R. F. Pierce, R. B. Ely, G. B. Nichols, J. R. Cravath, T. J. Litle, Jr., D. McFarlan Moore, J. D. Israel and W. R. Moulton.

Ralph C. Robinson read a paper entitled "Candlepower Measurements of Series Gas-Filled Incandescent Lamps." He showed that for filaments of different shapes at the same temperature the mean spherical candlepower per watt is the same, but the mean horizontal candlepower varies enormously and consequently the reduction factor has widely different values. In discussing this paper, Henry Schroeder said that although the lamps are still rated in terms of horizontal candlepower, the manufacturers aim to supply a definite number of lumens. For any one type of filament the variations between individual lamps are very slight. G. M. J. Mackay, George H. Stickney, J. R. Cravath and E. C. Crittenden also discussed the paper.

The session on Friday afternoon was devoted to papers on heterochromatic photometry and integrating photometers. Four papers were presented: "An Interlaboratory Photometric Comparison of Glass Screens and of Tungsten Lamps Involving Color Differences," by G. W. Middlekauff and J. F. Skogland, presented by Dr. Middlekauff; "An Average Eye for Heterochromatic Photometry, and a Comparison of a Flicker and an Equality-of-Brightness Photometer," by E. C. Crittenden and F. K. Richtmyer, presented by Dr. Crittenden; "The Integrating Sphere, Its Construction and Use," by E. B. Rosa and A. H. Taylor, presented by Dr. Taylor; "A Box Photometer," by L. O. Grondahl.

The first two papers were discussed by Clayton H. Sharp, G. M. J. Mackay, E. C. Crittenden, G. W. Middlekauff, Preston S. Millar, Herbert E. Ives, A. S. McAllister and L. C. Porter. The papers on integrating photometers were discussed by E. C. Crittenden, D. McFarlan Moore, W. F. Little, S. L. E. Rose, E. L. Clark, N. K. Chaney, R. B. Chillas, Jr., L. M. Morse and A. B. Herrick.

In the evening W. D'Arcy Ryan gave an illustrated lecture on "The Lighting of the Panama-Pacific Exposition."

Municipal Plant Shows Marked Business Gains.

The annual report of the municipal light department of Westfield, Mass., indicates remarkable increases in output and in income. There are now 1,404 meters on the lines, a gain of 285 over 1914. The department has more than 1,000 horsepower of motors connected, and the demand for both light and power is increasing rapidly. The income from the electric department for 1915 was $52,637 and the operating expenses were $42,721, the former being about $11,000, and the latter $6,500 greater, than during the year of 1914.

Banquet of Illuminating Engineering Society in New York on February 10 at Which Thomas A. Edison Was Made Honorary Member of Society.

Important Utility Merger Projected in Massachusetts.

The Connecticut River Transmission Company and the New England Power Company, both of them Massachusetts corporations, have petitioned the Board of Gas and Electric Light Commissioners for its approval of the consolidation of the Power Company with the Transmission Company, and its approval of the terms therefor.

It is proposed that the capital stock of the consolidated company shall consist of the present 25,000 shares of preferred stock of the Power Company and the present 25,000 shares of its common stock, and the present 11,950 shares of the Transmission Company, all of $100 par value, making the aggregate capital stock of the consolidated company $6,195,000 par value.

The consolidated company under the terms of the agreement shall issue not exceeding $3,219,000 of additional securities to pay obligations incurred for new lines, extensions, improvements and additions to lines and substations of the Transmission Company, now in course or contemplated for 1916, a hydroelectric plant at Readsboro, Vt., and additions to the four hydroelectric plants of the Power Company. Such additional securities to consist of not exceeding 7,190 additional shares of preferred stock and not exceeding $2,500,000, face value, of mortgage bonds, whereby the capital stock of the consolidated company will be increased from $6,195,000 to about $6,914,000, and the bonded indebtedness from $3,500,000 to $6,000,000; the proceeds of the additional issues to pay for costs of the following:

New lines, about	$2,200,000
Extensions and additions to lines, substations, etc., now in course of construction	170,000
Extensions, etc., contemplated during 1916	220,000
Readsboro hydroelectric plant	405,000
Enlargements and additions to four hydroelectric plants of Power Company	214,000

The petition points out that the lines of the Transmission Company are actually connected with the hydroelectric plants of the Power Company, these lines consisting of so-called "old lines" extending from the Massachusetts-New Hampshire line at Warwick southeasterly to Gardner, Fitchburg, Clinton and Worcester, together with substations and branch lines, for the acquisition of which $1,195,000 capital stock has been issued by the Transmission Company; and the "new lines," consisting of a line from Shelburne Falls to Ware, Millbury, Uxbridge and the Rhode Island line, and a line from Millbury to West Boylston, there connecting with the "old lines"; also a line from Ware to Monson, one from Shelburne Falls to Leyden and from Shelburne Falls to Adams and to Bennington, Vt., which together with substations, etc., cost about $2,200,000, for which the Transmission Company has issued no stock nor bonds.

The hydroelectric and storage reservoir properties of the Power Company consist of four hydroelectric plants on the Deerfield, a storage reservoir in Windham County, Vt., and other undeveloped hydroelectric properties on the Deerfield River in Massachusetts and Vermont.

Public Policy Conference of National Electric Light Association.

A conference of a number of the leading men in the electric lighting industry was held Wednesday and Thursday, February 16 and 17, in New York, presided over by W. W. Freeman, chairman of the public policy committee of the National Electric Light Association. The attendance was large and quite representative of all sections of the United States. It included President Lloyd and other officials of the Association and matters of present-day importance to operators and owners of electric lighting companies were discussed in executive session.

Dr. Louis Duncan Dead.

Louis Duncan, a member of the firm of Duncan, Young & Company, New York City, died at his home, 998 Prospect Avenue, Pelham Manor, N. Y., in his fifty-fourth year. He was best known as an electrical traction expert and was consulting engineer of the Rapid Transit Commission during the electrification of the transit systems of New York.

Dr. Duncan was born in Washington, D. C., March 25, 1862, and was graduated from the Naval Academy in 1880, being appointed an ensign three years later. In the same year he was sent to Johns Hopkins University by the Government to take a graduate course in physics and electricity, and during his course there determined the unit of electrical resistance. Dr. Duncan served as chairman of the Board of Judges of the International Electrical Exhibition at Philadelphia in 1884. In 1887 he received his degree of Doctor of Philosophy at Johns Hopkins University and

Louis Duncan.

then became a professor there, resigning from the Navy to accept the appointment.

During the Spanish-American War, President McKinley appointed Dr. Duncan an aid in forming a battalion of engineers, and he became major of the First Volunteer Engineers. After the war, he again entered business and in 1902 became head of the Department of Electrical Engineering at the Massachusetts Institute of Technology.

Dr. Duncan was president of the American Institute of Electrical Engineers from 1895 to 1897. He was an honorary member of the Franklin Institute, and was a member of the Mathematical Society of France, the Physical Society of France, the American Electrochemical Society, the Automobile Club of America, the Maryland Club of Baltimore, and was a fellow of the American Philosophical Society. In addition, he was a member of the University and Engineers' Clubs. His wife, a son and three daughters survive him.

Miscellaneous NEWS NOTES

To Test Concentric Wiring.—It is reported that the Rochester (N. Y.) Railway & Light Company will make test installations of concentric wiring with a view to its adoption if the tests are satisfactory.

Statistics of Holyoke (Mass.) Municipal Plant.—Power generated by the municipal plant during 1915 amounted to 14,264,700 kilowatt-hours, as compared with 14,088,000 kilowatt-hours during 1914. Receipts totaled $339,146, a slight decrease from the year before. The total number of electric meters set is 6,474, 629 having been added during 1915.

Rail Bonds Are Stolen.—About 170 copper rail bonds were removed from the tracks of the Lowell & Fitchburg (Mass.) Street Railway Company recently, being removed with a chisel and sledgehammer. As the bonds are worth about $1.75 each, the loss to the railway company is considerable when the cost of replacing them, together with the hindrance to traffic operation, is taken into account.

Report of Power Company Shows Large Increase in Business.—The annual report of the Kings County Electric Light & Power Company, Brooklyn, N. Y., shows the total number of contracts signed at the close of the year 1915 to be 32,581, an increase of 5,000 over the preceding year. The power output for 1915 was 143,997,941 kilowatt-hours, an increase of 31,720,515 kilowatt-hours over 1914. The increase in the company's business has made additional equipment necessary, and a 30,000-kilowatt turbogenerator will be installed during the coming summer.

Circuit Court Renders Decision in Montgomery (Ala.) Power Case.—The United States Circuit Court of Appeals has handed down a decision holding that the contract of the Montgomery Light & Water Company to furnish current for power to the Montgomery Light & Traction Company is valid and rendering judgment against the latter for full amount claimed. Under the contract about $200,000 is now due Montgomery Light & Water Company. The contract has three years yet to run. The traction company refused payment on the ground that the contract was invalid.

Printing Telegraph Introduced at Boston.—The Associated Press, Western Union and Postal Telegraph companies have installed the Morkrum automatic printing telegraph in their Boston offices. The apparatus consists of a universal keyboard operating a perforator which prepares a tape. The latter is fed through the transmitter, driven by a one-thirtieth horsepower motor. At the receiving end the signals are picked up through relays, and by means of selective apparatus the various signals are registered on a printing typewriter. Successful tests have been made with the apparatus between New York and San Francisco, with six repeaters in circuit, a speed of 58 words per minute being achieved. The average working speed for normal service is between 60 and 70 words per minute.

Dinner a la Electricity.—One of the first dinners prepared entirely by electrical means to be served in Oakland, Cal., was given by the Great Western Power Company in that city February 8. Covers were laid for 30 prominent men in the electrical industry, W. M. Briggs acting as toastmaster. Addresses were made by B. C. Hill, representing the city of Oakland; Lee Gilpen, representing the California Electrical Contractors' Association, and by Messrs. Mittick, Norling, Trogo, Clark, Ellis, Mellman and Woodward. Mr. Briggs gave an interesting talk on the company's pioneer work in promoting domestic cooking with the electric range. Assisting in the evening's festivities were F. H. Woodward, the company's Oakland manager, and W. B. Sedgley, recently appointed by the Great Western Power Company as agent at Martinez, Cal.

President's Visit Stimulates Lighting.—The visit of President Wilson to Kansas City recently caused the officials of the Union Station to order the full illumination of the waiting room, where heretofore only a small part of the equipment has been used. Hereafter the complete equipment will now be employed, the effect of the full lighting in the president's honor having been impressive and suggesting the advantage of continuance.

Hydroelectric Development in Oregon.—Rights for the development of 456,410 horsepower in the state have been initiated, according to claims filed with State Engineer Lewis for 1916. The claims total 219, and in many cases represent power which the claimants assert the right to develop, but which yet have not been actually developed.

Fined Under Provisions of Electrical Code.—Under the provisions of the Electrical Code of the city of New York, Michael Jacovone, 643 West Fiftieth Street, has been fined $50. Jacovone's offense consisted in a failure to correct serious electrical defects existing on his premises within the time fixed by an order of the Commissioner of Water Supply, Gas and Electricity. This is the first conviction under the new ordinance.

Louisville Jovians to Hold Rejuvenation.—Preparations for a rejuvenation on March 17 are being made by Jovians of Louisville, Ky., 26 applications already having been received. The local organization now numbers 126 and, after the campaign for new members, which will be launched shortly, it is expected that the membership will be increased to 175. The Louisville Jovian League will hold its annual election on February 22.

Joint Meeting of Engineers at Boston.—The Boston Section of the American Institute of Electrical Engineers, American Society of Mechanical Engineers and the Boston Society of Civil Engineers held their seventh annual joint banquet February 8 at the City Club, Boston, with about 500 in attendance. Charles L. Edgar, president of the Edison Electric Illuminating Company of Boston, presided as toastmaster, and the speakers were Governor McCall, Colonel W. E. Craighill, U. S. A., William Barclay Parsons of New York, John R. Freeman, of a recent Panama Commission, and Dr. John A. Brashear of Pittsburgh, Pa. Governor McCall said the science of engineering could be greatly expanded along social and economic lines, and that the profession is bound to have a larger part in the economic and efficient administration of government.

Recent Storm Damages Oregon Utilities.—Damage to power and light transmission lines on poles in the outlying districts of Portland during the recent storm which swept over the Pacific Norhwest, will amount to thousands of dollars, according to officials of the Portland Railway, Light & Power Company. After the storm had subsided, many wires snapped from the weight of ice, and for several days the company was busy repairing the numerous breaks. Power for its city lines and interurban roads, besides energy sold to the electric lines of the Southern Pacific, Oregon Electric and United Railways, and power for manufacturing plants in Portland, is generated by the Portland Railway, Light & Power Company. According to information made public, the 11,000-volt lines connecting the substations gave the most trouble during the storms. The power plants of the corporation were operated with but little difficulty, but when the two 60,000-volt lines from Cazdero fell, the two steam auxiliary plants were called into play. At this writing, it is reported lines have been repaired and conditions are again normal. At Milton, Ore., backwater from the tailrace flooded the power house of the municipal lighting plant there, putting the plant out of commission.

Electricity in Automobile Manufacturing

Details of Electrical Equipment in the Plant of the Franklin Automobile Company Which Secures Energy from the Local Central-Station Company

Industrial Power Series—Article No. 154.

There is probably no industry at the present time that has developed with greater rapidity than the manufacture of automobiles, and the subject of this article, the Franklin Automobile Company, Syracuse, N. Y., is an example of a modern industry. In 1898 the first four-cylinder automobile was built in this country which in 1902 took the form of the Franklin car. For fourteen years the growth of the company has been rapid and during the year 1915 the production of cars was 4,300 and the estimated production for 1916 is 8,500, or nearly double that of the previous year. The Franklin Company was numbered among the pioneers in the use of electric motor drive and at the present time is operating nearly 100 motors and is about to install 18 additional motors in a new building nearing completion.

For use in the cars 97 per cent of all material is made in the works which includes practically everything with the exception of the transmissions, differentials and aluminum bodies. Service is furnished by the Syracuse Lighting Company, at 2,300 volts, three-phase, to a substation in the Franklin buildings where the current is transformed to two-phase, 220 volts by means of transformers connected for three-phase, two-phase transformation. The transformer equipment includes four 150-kilowatt oil-insulated transformers and two 600-kilowatt units of the same type.

Scientific management and production receives especial attention and many innovations are in evidence in the production department. Every unit is made on part number and the lot sizes are determined for a theoretical minimum which is based on 22 variables. The quantity of production is determined by a specialist and production on one part is eased off when thought desirable to gain uniformity in quantity and parts are picked up which are dragging. An elaborate system of workmens' records is kept so that the qualifications of a man necessary to perform a particular part of the work can be found at once. A central department dispatches each job over each machine and no material is moved by the skilled workmen. A battery of storage-battery trucks is kept in operation and they transfer approximately 300,000 pounds of material weekly. As to the advantages of electric motor drive and central-station service in an automobile plant, in many respects they are quite similar to those outlined for other similar industries. The majority of the parts are small and the processes diversified.

Motors in Engine-Test Department of Franklin Automobile Company, Syracuse, N. Y.

Electroplating Department Showing Dynamo in Background.

Group of Motor-Driven Machines in Small-Parts Department.

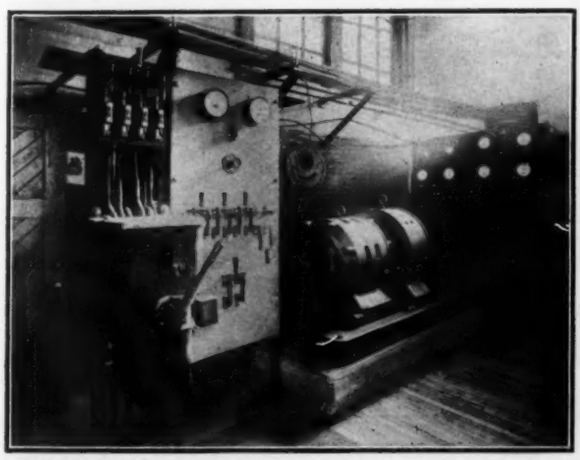
Process of Manufacture.

Before taking up some of the manufacturing details it may be in order to describe briefly the Franklin Company's product which includes a number of styles of pleasure vehicles. One of the principal features sought in the design of Franklin cars is a minimum weight with a maximum of sturdiness. It is claimed that by means of this light-weight construction that shocks created by inequalities in the road's surface are correspondingly reduced. The light weight is obtained largely through flexible construction.

Another feature of the Franklin car is the air cooling of the engine. The object for cooling an automobile engine is to keep the temperature of the engine within the range of efficient operation. Not all of the heat that is generated by the combustion of the mixture goes into the power, a portion of it being transferred to the cylinder walls and must be carried away. There are two ways of accomplishing this cooling, one by the direct application of air currents to the cylinders, and the other by the direct application of air to the cylinders through the medium of water. The air cooling in this car depends upon the movement of the flywheel in which is incorporated a special fan which draws in over the cylinders 2,200 cubic feet of air per minute when the engine speed is 1,500 revolutions per minute. Flexibility is carried into the power application of the car, as the drive from the rear wheels is transmitted through the rear springs instead of torque tubes or radius rods. The car frame is made of second growth ash which is claimed to be lighter for frame construction than steel frames of equivalent strength.

The Dyneto electric starting and lighting system used on the Franklin cars is the single unit type that consists of a motor-generator that serves both to supply the current and start the engine. One of the interesting applications in connection with the electric drive is found in the engine test department where the engines are driven by electric motors for the preliminary test before being driven by their own power. The engines are run at various speeds corresponding to given road speeds of the car. There is an equipment of six 25-horsepower motors which drive two engines each, one engine being direct-coupled to the motor and the second engine is driven from the first engine by means of a chain belt. Twelve engines can thus be tested at one time. The motor speed is 685 revolutions per minute. The engines are handled by hand hoists and are bolted to a regulation crank case supported on iron legs. For high-speed tests there is an equipment of four test blocks with four 30-horsepower motors having provision for direct-coupling one motor to a single engine by means of flexible couplings. These motors operate at 1,745 revolutions per minute. The engines after receiving the motor-driven test are tested under their own power and then mounted on the chassis for the first road test. After the latter has been completed the bodies are placed on the chassis and a second road test is run. The cars are then subjected to a final inspection given a rub down are prepared for shipment.

All the woodwork of the cars is prepared in the woodworking department where there is an equipment of a sand-paper machine, wood planer, miscellaneous woodworking machine and an exhaust fan for removing the



Motor-Generator Set Supplying Direct-Current Motors.

Ten-Kilowatt Spot Welder and Motor-Driven Lathes.

Motor Data Sheet.

Franklin Automobile Company, Syracuse, N. Y. Service from Syracuse Lighting Company's 2300-volt, three-phase distribution. Three-phase, two-phase transformation, 2300/220 volts. All motors 2-phase, 220-volt squirrel-cage machines unless otherwise noted. Standard pulleys.

No.	Horse-power.	Kind of Drive.	Speed, R. P. M.	Application.
1	7.5	Belt	1120	Sand-paper machine.
1	10	Belt	1120	Wood planer.
1	10	Group	1120	Turning machine, band saw, three drills.
1	30	Group	850	Sticker, shaper, circular saw.
1	15	Belt	850	Exhaust fan for removing shavings.
1	15	Belt	850	Machine for pressing rear axles.
1	10	Group	1120	Five drill presses, one engine lathe, two grinders.
1	15	Group	1120	Group small machine tools.
1	10	Group	1120	Two wood lathes, four engine lathes.
2	2	Direct	1800	Paint spraying machine.
4	2	Direct	1800	Four paint spraying machines.
1	2	Direct	1800	Machine for drying wheels.
1	2	Belt	1800	Air purifier.
1	2	Belt	1800	Enamel separator.
1	15	Belt	1120	Six gear shapers.
1	25	Group	1120	Eight grinders, two engine lathes, one drill press.
1	10	Belt	850	Machine for testing transmissions.
1	15	Group	1120	Group of engine lathes.
1	40	Group	1200	Twenty-six drill presses.
1	15	Group	1120	Ten milling machines.
6	25	Direct	685	Six engine test blocks—low speed.
4	30	Direct	1745	Four engine test blocks—high speed.
1	10	Group	1120	Group small machine tools, and group of engine lathes and drill presses.
1	5	Belt	1120	Air compressor.
1	7.5	Group	1120	Group small machine tools.
1	7.5	Belt	1120	Pratt & Whitney grinding machine.
1	15	Group	850	Group of lathes, milling machines and drill presses.
1	15	Direct	1140	Engine test block.
1	5	Group	1150	Engine lathe, emery wheel.
1	10	Group	850	Broaching press, drill press, three engine lathes, group small machine tools.
2	25	Group	1120	Eleven engine lathes, five grinders, one shaper, four milling machines, ten drill presses, three screw machines.
1	10	Group	850	Four tumblers, three hammers, forge blower.
1	10	Group	850	Group of small machine tools and blower.
1	10	Group	1120	Five emery grinders.
1	25	Group	1150	Three grinders, two radial drills.
1	20	Chain	1120	Fox multiple spindle drill.
1	30	Group	1120	Ten milling machines, radial drill, three drill presses, seven milling machines.
1	75	Group	850	Twenty-two grinders.
1	15	Group	1150	Eight drill presses, three engine lathes.
1	50	Group	850	Eleven Jones & Lamson screw machines, five automatic screw machines.
1	30	Group	1120	Group Jones & Lamson screw machines.
1	25	Group	1120	Group automatic screw machines.
1	10	Group	1120	Four drill presses, nine turret lathes.
1	1	Group	1700	Two small drill presses, two emery grinders.
1	5	Group	1120	Group of sewing machines.
1	10	Group	1150	Five drill presses, tool grinder, group small machine tools.
1	10	Belt	1120	Ten-kilowatt Toledo spot welder, 35-kilowatt Toledo spot welder, exhaust fan for removing dust from polishing wheels.
1	15	Group	1120	Twelve polishing wheels.
1	5	Belt	1120	2500-watt plating generator.
1	3	Belt	1150	Small cylinder press.
2	1	Belt	1140	Two small job presses.
1	0.5	Belt	....	Paper folding machine.
1	2	Belt	1700	Paper cutter.
				} D. C. Motors 220 volts
1	0.16	Belt	1200	Stitching machine. Single-phase motor.
1	74.3	Belt	1170	50-kilowatt, 250-volt direct-current generator for supplying direct current to direct-current motors.
1	10	Belt	850	Freight elevator.
1	20	Belt	1120	Freight elevator.
1	25	Belt	850	Freight elevator.
1	10	Direct	750	Freight elevator.
				} Cutler-Hammer control

shavings. The first two machines and the fan are individually driven; the two groups of miscellaneous machines are driven by two motors. There are a great number of manufacturing processes which are carried on in miscellaneous machine tools in the various departments. The cylinders and boxes are ground to a fit on special grinding machines which are driven in groups by motors.

Motor Drive in Paint Shop.

The paint department is interesting on account of the manner in which the paint is applied. The various parts are placed in a paint spraying machine of which there are six and the paint sprayed on with a hose and nozzle. In connection with these machines there is a motor-driven fan for removing the gases and superfluous paint, the latter is deposited in a metal can and the gases excluded from the building. The machines are operated by two-horsepower motors. The wheels are dried on a special machine which revolves the wheels slowly. This machine is also driven by a two-horsepower motor. In addition the paint department contains an air purifier and an enamel separator each driven by a two-horsepower motor. The speed of all the motors in the paint department is 1,800 revolutions per minute. There are of course, experimental departments and numerous individual departments for the necessary upkeep of the plant and for repair work. In the metal-body department where the metal parts of the body are assembled there are two Toledo spot welders.

There is a complete printing department in connection with the Franklin plant where practically all of the company's printing is done. There is a cylinder press, two job presses, folding machine, paper cutter and a stitching machine. All of these machines are driven by direct-current motors, 220-volts, with the exception of the stitching machine which is driven by a single-phase motor. The direct current for these motors is supplied by a 50-kilowatt, direct-current, 250-volt generator direct-coupled to a 75-horsepower induction motor. There are four electric freight elevators driven by two 10, one 20, and one 25-horsepower motors. There is a complete electro-plating department which includes a 2,500-watt, direct-current plating generator belted to a five-horsepower induction motor operating at 1,120 revolutions per minute.

Correction.

A typographical error in the issue of February 12, concerning "Central-Station Costs in Massachusetts" (page 284), made it appear that the Boston Edison Company was referred to, when the Brockton company was the company under discussion. Its principal generating station is at East Bridgewater, Mass.

Central-Station Problems Discussed at Boston Luncheon.

About 150 attended the February 10 get-together luncheon at the American House, Boston. G. K. Dustin, of the Massachusetts Lighting Companies, Boston, presided, and the meeting was devoted to an informal discussion of central-station problems and practices. A poll of companies showed that 64 out of a total of 67 sell appliances at a profit, the usual per cent being 10, and the maximum about 30 per cent. Of 40 companies with elevators on their circuits, 15 use reverse-phase relays.

It was stated that insurance underwriters make no special ruling on the use of Type C lamps in show windows, but that an attempt is made to limit the temperature to 200 degrees Fahrenheit.

About half the central stations represented make a point of soliciting new enterprises for their territory.

Manhole and cable records of the Boston Edison Company were shown. Causes of over-registering of meters were considered.

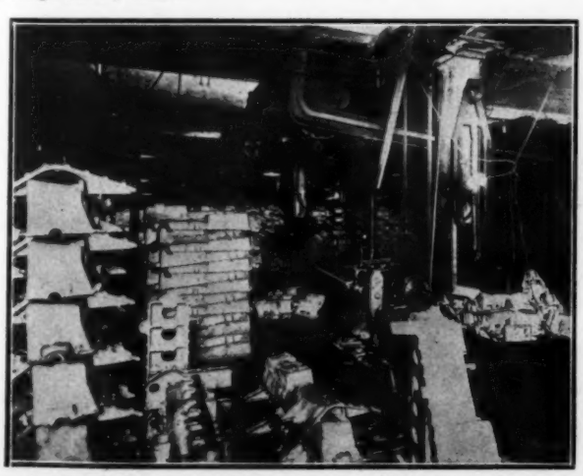
An interesting practice of the Worcester Electric Light Company is to leave a meter on discontinued service for a period of 30 days, with a tag attached stating that service is available at once on application. The company is discontinuing all inclosed arcs.

Residence Lighting Committee Active.

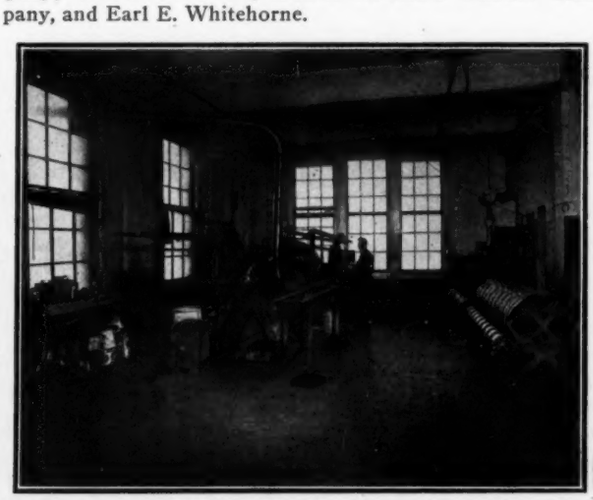
The committee on Residence Lighting, Lighting Sales Bureau, N. E. L. A., of which Fred H. Scheel, Public Service Company of Northern Illinois, Streator, Ill., is chairman, is actively engaged in the preparation of a report showing various methods of securing residence business and giving details of those proving most successful.

This report is part of the report of the Lighting Sales Bureau which is to be presented at the convention in Chicago this year and is being planned with the idea of giving assistance to the business-development departments of lighting companies. The report will be practical to such a degree that every lighting sales manager and lighting salesman interested in residence business will find it profitable.

In compiling the report of the committee, summaries on the subject of residence business were considered which were prepared by T. H. Kettle, Minneapolis General Electric Company; W. H. Wells, Edison Electric Illumination Company, Brooklyn; R. G. Gentry, Denver Gas & Electric Light Company; W. P. Lyon, Commonwealth Edison Company, Chicago; G. W. Rieger, Philadelphia Electric Company; Charles B. Yonts, Illinois Northern Utilities Company, and Earl E. Whitehorne.



Group of Motor-Driven Milling Machines at Franklin Plant.



Section of Paint Shop Showing Motor-Driven Spraying Machines.

COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

SERVICE TO LIGHTING CUSTOMERS.

Philadelphia Electric Company Has Well Organized Department for Giving Service to all Customers and Prospects.

By G. B. Regar.

The work of the Lighting Service Department of the Philadelphia Electric Company presents no new, radical or startling development in its central-station practice, but has for its object a more thorough and systematic handling of the ever increasing details and importance of service.

In this enlightened, progressive age, we find in all commercial pursuits, and especially in public service corporations, a demand for something more than the mere physical exchanging of a commodity for a compensation. A concrete example of the transaction of delivering to one's home a spool of thread at an acknowledged financial loss, presents itself, but has for its compensation the fact that a high grade service has been rendered, which had it not been the case would no doubt have precluded further business transaction with the customer. We read the stupendous reports of passengers carried each year by the railroads with a constant decreasing loss of life. This has been made possible by the careful study of service conditions, in the nature of exacting employees, of perfected methods of signaling, and accident prevention, steel cars and many other details which go to make up their vast systems. Many demand an extra service in the nature of parlor and chair cars, even at an added expense.

It is true that the public demands this service, and is willing to pay for it. But efficient business methods enable the larger corporations to give this service at no additional compensation from the public.

It is well recognized that an electric lighting company must sell something else besides electricity, viz.: Service. It is also a fact that the completeness of that service and the manner in which it is rendered are reflected in the success of the company and in its relations with the consumers. The consumer purchases electricity for illumination, power or heating to fulfill his requirements of a business or personal nature. It is desired to accomplish certain results in the best possible manner, at the lowest cost and without delay or friction in his business dealings with the lighting company. Therefore it is evident that each detail of the central station's business in the supplying of the current and collection of the bills must harmoniously dovetail perfect and satisfactory service from the company to its consumers.

The far-reaching importance of the lighting phase of our work can best be described by quoting the opinion of Joseph B. McCall in his presidential address to the National Electric Light Association: "It is gratifying to find that increasingly greater attention is being given by all concerned in all parts of the world, and particularly in this country, to the proper working out of our artificial illumination problems, particularly with relation to its effect upon the health and happiness of our citizens.

"It is not too much to say that this renaissance in lighting methods has been brought about primarily, by the development of electricity as an illuminant.

"The infinite possibilities in the way of bettering artificial illumination created a new type of engineer. The scientific study of illuminating problems and the importance to general public health in the matter of conserving vision have led us to the point where not only must efficiency and economy not be neglected, but the problem of health for the masses must be accorded its proper importance.

"The situation imposes upon us in the central-station industry, certain duties and responsibilities. We must work for the betterment of conditions in order to meet fully and satisfactorily the increasing requirements of the age, bearing in mind the essential necessity of conserving the health and energy of the human race so that the faculties, mental and physical of all of us, may be devoted to the highest type of progress in the world's work."

Functions of Lighting Service Department.

The lighting load of a central station is a very desirable one. The public is being educated on the subject of efficient lighting through the daily papers, magazines, advertising by the manufacturers of lighting units, central-station engineers and the actual installations of improved lighting. Electric illumination is cheaper today than it was a few years ago, due primarily to the increased efficiency of lamps and the prominence of illuminating engineering in central-station practice.

The Philadelphia Electric Company has always been an exponent of the best and most efficient lamps procurable for its customers. Its knowledge of matters pertaining to the industry and of usefulness to its consumers has always been placed at their disposal. It early grasped the importance of illuminating engineering and educated its salesmen along these lines, realizing that a general knowledge of the subject by the selling force would be reflected by the installation. It organized an Illuminating Engineering Department consisting of men well versed in the more scientific applications of illumination, and able to cope with the new and varied conditions and placed this department at the services of its consumers without cost to them, through the agencies of newspaper, street-car and sign advertising, and general advertising matter and also the verbal offering of this service by the salesman and other representatives.

An analysis of our records shows many lamps other than Mazda connected to our lines. It is further evident that with the commercial activity in lighting units, the advent of the type "C" Mazda lamp, and last but far from least, the many instances of an utter disregard for efficiency in the matter of installation of lighting units, leaves much work to be done by the lighting specialists of our company.

Exemplifying the statement in the opening paragraph that no new departure has been made in the formation of the Lighting Service Department, it is only just to say that it was organized to extend its plan of service more systematically, having 100 per cent for its goal. The predominant factor of this work is that this service seeks out the customer instead of waiting for him to take the initial step. Its fundamental principles are to co-operate with the sales force in laying out proposed lighting installations and compiling the necessary engineering and commercial data per-

taining thereto, for the enlightenment of the proposed consumer. It co-operates with the district managers in holding the business connected to the lines, by pointing out to the consumer the faults of his installation and the necessary changes to make a well balanced and efficient installation.

The department consists at the present time of seven men with the necessary complement of clerks and stenographers. Its headquarters are at the main office, where three of its men are located, the remaining four being assigned to other districts and making headquarters there. The district men report by telephone to headquarters morning, noon and night, to keep in close touch and to follow cases needing immediate attention. All requests for information or complaints are called on within 24 hours and fully 75 per cent within six hours.

Lighting Specialist Visits Installations.

On receipt of a request for information or a complaint from a consumer, either by personal call, telephone or letter, the person receiving such request fills out a blank form known as "Office Notice to Service Department." This blank is in triplicate. The original is immediately forwarded to headquarters, the duplicate to the Lighting Service representative of the district and the triplicate retained for office files. If the case to be called on is in other than the district receiving the call the information is given over the telephone to the proper districts and the blank forms follow in the company mail.

The same procedure is carried out by salesmen in requesting the aid of this department in preparing lighting plans for new or proposed installations or for changes in existing installations. Practically all cases of this character are handled by the lighting specialists stationed at headquarters, it being considered inexpedient to permit the district men to devote a considerable period of time—some time extending into several hours or even days on any one case, in which event they would often fail to give service to some consumer desiring immediate attention. They are, however, fully capable of handling the lighting problems coming before them, and care for all, except as stated, the large and extended ones.

The personnel of the department consists of men who have been connected with the company for extended periods and who have had technical training in the higher schools and colleges, or who have worked their way through the technical and engineering departments of the company. They must possess a thorough knowledge of the details of the company, and be well versed in the commercial phases. It is needless to say that men, assigned to this department must possess a courteous and diplomatic personality.

There is no limitation placed upon the character of work. The consumer requesting an inspection of his house lighting for the purpose of seeing that his lamps are in good condition, is accorded the same prompt and careful attention as the proposed lighting of a large factory, necessitating written specifications and plans.

Night Inspections of Installations.

Each district representative is in a measure held responsible for the lighting of the installations in his district, at least as far as his endeavoring to convert the consumer as to the errors of the installation. It is part of his duty to inspect at night the commercial lighting installations—at least one inspection per week must be made. These are reported to headquarters in a blank form in duplicate. The original is forwarded to the district office, who issues instructions on the triplicate form, as previously explained, and the consumer is called upon.

These cases especially demand a diplomatic treatment, the manner of approach being an important factor in the results obtained. Many of the consumers of the smaller business class look with suspicion on the first visit, and it can readliy be seen that the salient point is to gain the consumer's confidence and assure him that the call is for his benefit. To immediately launch into the fact that a Mazda lamp will cost him so much money, without first absolutely convincing him that it only consumes about half the current, would offset the results expected.

Type C Lamps Recommended.

In all cases of lamp renewals where other than Mazda lamps are placed a pamphlet describing the efficiency of Mazda lamps is mailed; these bring many requests for inspection and information. It is now contemplated to make a personal call on every such consumer for the purpose of explaining the advantages of this lamp.

When the 60-watt Mazda lamp was changed from a unit base to a standard base, the company changed, without cost, the type "H" holder to type "O." This rule has now been made general, and, in fact, any type holder whatever is taken in even exchange for the correct form. A casual observance of lighting installations in the smaller stores shows that the plain three-screw flat-type holder is universally used—first, no doubt, because it is the cheapest, and, second, because the electricians and fixture manufacturers do not investigate the type of lamp to be used.

Another very distracting fact is the replacing of a number of lamps with fewer lamps. A notable example is in deck windows with cone reflectors. Many consumers will remove perhaps 16 40-watt Mazda lamps and install four 100-watt type "C" Mazda lamps. The horrible resulting glare is very evident. This same result occurs in the cases of hundreds of fixtures. There are many instances of a fixture with three 60-watt Mazda lamps not giving the results desired. The consumer replaces these three with one 200-watt type "C" lamp, with the result that the fixture is unbalanced, the lamp extends below the shade, and the whole result is poor.

These results are also stimulating the use of the single unit, and we are getting more uniformly good results with it because of the impossibility of it becoming unbalanced by lamp changes.

Electric Radiators Heat Office Building While Being Moved.

The Boston Elevated Railway Company, owners of a brick office building occupied by the Bay State Street Railway Company as headquarters of its electric freight business, recently moved the building about 150 feet to a new location, on Atlantic Avenue, Boston. During the process of moving, heating for the offices, which continued to be occupied without interruption, was provided by means of about 50 electric radiators, which were connected to the Elevated Company's circuits by means of temporary wiring. As the moving took place during midwinter, the need of artificial heat presented a problem which was successfully met by the electric heating installation.

Maine Power Company Holds Incubator Sale.

The Central Maine Power Company, Augusta, Me., has been conducting a special display and sale of the Lo-Glo poultry outfit, at all its appliance stores. The complete outfit, consisting of one 120-chick electric incubator, one 100-chick electric hover, one 100-chick run, one Lo-Glo egg tester, a 3-compartment hopper, drinking fount, chick feed and dry-mash trays, were offered for $38.75.

The company pointed out that the electric apparatus is free from the fire hazard attending oil-burning incubators and called attention to the fact that hatching the chickens is only part of the process, the perfectly even temperature of the hover being necessary to obtain best results.

Large Sign Installed in Hartford.

The Travelers Insurance Company has erected on its Home Office Building in Hartford, Conn., what is said to be the largest electric sign employed by any insurance company in the world.

This sign extends across the front of the building a distance of 120 feet and has letters 9 feet high. The body of each letter is 18 inches wide, is painted white, and has a collar to give the edge of the letter definition. Two hundred and fifty electric bulbs are used to light the sign, and experiments have shown that it will be readily legible at a distance of three miles or more.

The Travelers building, which is a ten-story structure on the Main Street of Hartford, is located in such a position that the sign can be easily seen from the trains of the New York, New Haven & Hartford Railroad as they enter and leave the city. The sign will be kept burning all night.

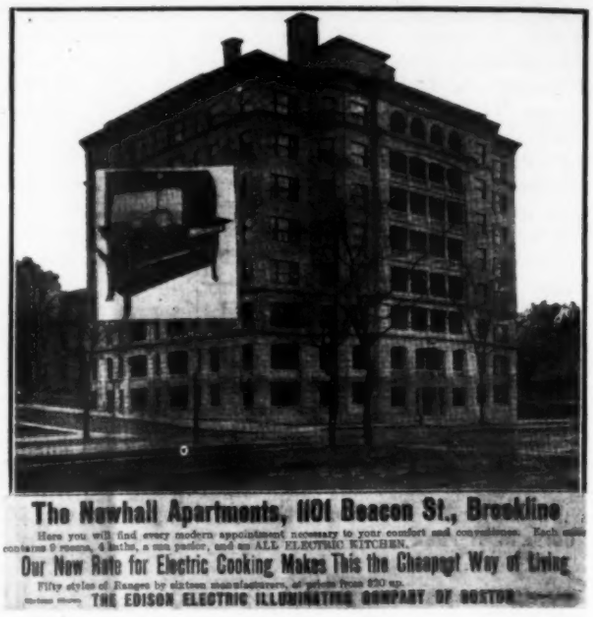
Flag Sign Campaign Inaugurated in Chicago.

In furtherance of the nation-wide movement to popularize the electrically lighted flag sign, the Commonwealth Edison Company, Chicago, Ill., has inaugurated a sign campaign and is offering special prices on a standard four-foot flag sign. Before actively starting the campaign the company succeeded in selling two of the signs to the city and these are now installed over the two main entrances of the City Hall. Two similar signs have also been installed at the entrances of the Edison Building.

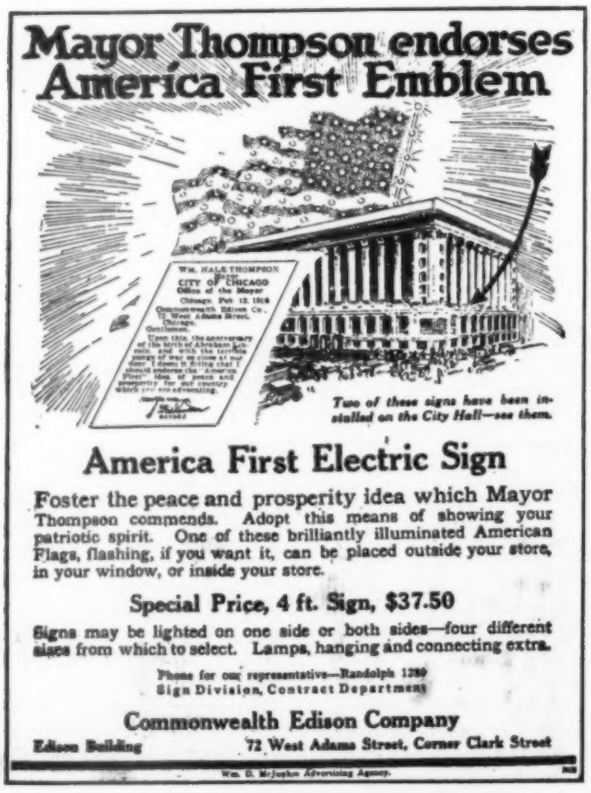
The accompanying illustration shows the initial advertisement used in the campaign and embodies a letter from Mayor Thompson endorsing the movement.

Edison Company Advertises Building Equipped With Electric Ranges.

As a feature of its campaign to increase the use of electric cooking, the Boston Edison Company is advertising in the "For Rent" columns of the daily papers, apartments in which electric ranges have been installed. The accompanying illustration shows a typical advertisement. In addition to the publicity which is directed to the apartment so featured, it is stated that many owners and agents of other buildings are being favorably impressed with the co-operation of the Edison company and with the advertising possibilities of a building equipped with electric ranges.


The Newhall Apartments, 1101 Beacon St., Brookline
Our New Rate for Electric Cooking Makes This the Cheapest Way of Living
THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON

Boston Edison Company Advertisement in "For Rent" Section of Daily Papers.


Mayor Thompson endorses America First Emblem
Two of these signs have been installed on the City Hall—see them.
America First Electric Sign
Foster the peace and prosperity idea which Mayor Thompson commends. Adopt this means of showing your patriotic spirit. One of these brilliantly illuminated American Flags, flashing, if you want it, can be placed outside your store, in your window, or inside your store.
Special Price, 4 ft. Sign, $37.50
Signs may be lighted on one side or both sides—four different sizes from which to select. Lamps, hanging and connecting extra.
Phone for our representative—Randolph 1280
Sign Division, Contract Department
Commonwealth Edison Company
Edison Building 72 West Adams Street, Corner Clark Street

Advertisement of Commonwealth Edison Company.

Unique Features of Range Campaign on Coast.

A unique and interesting selling campaign on electric ranges is about to be put on in California, the progress and success of which will be watched with keen interest by the men identified with this industry.

The Federal Sign System (Electric) of San Francisco, representatives of the Globe Stove & Range Company, Kokomo, Ind., is making arrangements with the Pacific Coast power companies to demonstrate Globe electric ranges to customers on a plan, the main features of which are as follows:

A Globe range will be mounted on a motor truck carrying meters graduated in "cents" and "cents per hour" for the easy understanding of the trial by the customer.

The truck will move from house to house in a given town giving complete cooking demonstrations on the back porch of each prospect.

The range will be connected to the company lines outside of the household meter so that the trial costs the customer absolutely nothing.

The companies which have adopted this plan are confident that it will produce most gratifying results.

Large Increase in Sale of Power to Steel Industries in Ohio.

Four subsidiaries of Cities Service Company in comparatively small cities in Ohio—the Alliance Gas & Power Company, the Trumbull Public Service Company, of Warren; the Massillon Electric & Gas Company, and the Elyria and Lorain electric properties—report sales of power to steel and allied industries, expressed in gross revenue in 1913, of $119,778; 1914, $181,809, and 1915, $306,136.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

ELECTRICITY IN SMALL INDUSTRIES.

Central-Station Service Effects Marked Economies in Several Small Plants in Auburn, N. Y.

In a recent article in this department, the general advantages of electric drive and central-station service for small manufacturers were discussed. The present article takes up the details of several small manufacturing plants now using central-station service and motor drive. One of these plants formerly used water power and another a gas engine. In both of these latter cases remarkable saving in power costs and increased production has been the result. Therefore, before taking up specific details, it may be well to draw some comparisons between the relative advantages of electric, water and gas power.

One of the greatest limitations of the gas engine and the water wheel is that they cannot be appreciably overloaded, and the former operates economically only at or near full load. When a water wheel is overloaded there is a wide fluctuation of speed with fluctuations of load which impairs the product manufactured and decreases output. The efficiency and power of a water wheel is seriously impaired by low water in either the head or the tail race and foreign matter and ice are a constant source of trouble. The electric motor is noted for its overload capacity which is limited only by the heat that it can radiate, and therefore for short periods it can carry excessive overloads.

In many localities, where water power is used, it requires the services of a man continually at the intake screen to clear obstructions, and if the wheel is stopped for any reason, production ceases and the overhead charges still continue. From one standpoint the gas engine and the water wheel are alike in objectionable features, that is, the power must be transmitted mechanically from a central point, necessitating friction losses and cost of upkeep of large shafts and belts. The gas engine as frequently erected is noisy, bulky and subject to continuous vibration, and requires an especially built foundation. The electric motor is practically noiseless, occupies small space, requires no foundation, can be placed on the floor, mounted on the wall or suspended from the ceiling, wherever it is most convenient for the work. To start a water wheel it is necessary to manipulate cumbersome gates and unless a complicated and expensive governor is installed a man must be stationed at the gates to manipulate them with reference to the load.

The gas engine must be turned over by hand, unless compressed air or other external power is at hand which can be applied, while the electric motor will start with full load by simply throwing in a simple starting device. It is frequently claimed that internal-combustion engines operate at a very low cost per unit of energy produced. These figures, however, apply only when the engine is operating under most favorable conditions as regard load, quality of fuel, adjustment of the mixture, the ignition, etc. When operating under unfavorable conditions the cost of operation per unit of energy may be nearly twice the figures claimed. Taking this into consideration, and also the fact that the first cost of the internal combustion engine is nearly double that of an electric motor of equal rating, it is seen that even on the basis of cost of energy, the electric motor under operating conditions gives more favorable results than the internal-combustion engine. The data given in connection with the following installations will illustrate the arguments set forth in the preceding paragraphs.

National Rug Company.

This small industry is devoted to the manufacture of rugs of all sizes and qualities from old carpets. Although there are a number of such industries in the country, the process is comparatively new and offers an excellent opportunity for the use of electric drive and central-station power. Owing to the nature of the work hand looms are used, but machines for fraying the edges of the strips of carpet used in the manufacture of the rugs are power driven. The general process of manufacture is as follows: The old pieces of carpet as received are first thoroughly cleaned and cut into strips approximately three-fourths of

Motor-Driven Machine Tools, Jewell Manufacturing Company.

Motor Drive in Leather-Goods Plant.

Motor-Driven Rug Machines.

an inch in diameter. The brussels strips are run through the fraying machines which consist of two wheels, slightly separated with serrated peripheries, which bear on a steel roller. The strips are passed through the machine as the wheels revolve, which frays or ravels out the edges of the strips. After fraying, the strips are twisted into spirals by hand and used in the looms as the yarn is used in the original manufacture of the carpet. Ingrain and other qualities of carpet fray when cut into strips and do not need to be passed through the machines. The finished rug presents a handsome appearance, being alike on both sides.

In the National rug plant there are two fraying machines group driven by a five-horsepower induction motor operating at 1,800 revolutions per minute and equipped with a four-inch pulley. There are five hand looms, respectively 3 feet and 8 feet wide, three of the former and two of the latter. The plant has a capacity of 250 square yards of rugs a day under normal working conditions. The average consumption of energy is 161 kilowatt-hours monthly. Formerly a gas engine was employed using illuminating gas from the city mains and from careful tests it has been shown that there is a saving of 25 per cent in power costs by the use of electric power over the old method of drive, aside from the other advantages.

Auburn Leather Goods Company.

This concern manufactures automobile parts of leather, fiber, paper, asbestos, and felt, including gaskets, shims, friction disks, tire valves, washers, etc. In addition plumbers and hydraulic supplies are made as well as leather advertising novelties. There was formerly a department for the manufacture of infants' shoes but this has been abandoned and will be devoted to advertising novelties. Water power was used until about 1.5 years ago, but owing to the many disadvantages it was abandoned and electric drive substituted. Although the water rights cost very little an official of the company stated that electric power has cost much less than water power. The company under the old power paid a man from $10 to $12 a week to do nothing but keep refuse and ice away from the intake screens and there was considerable trouble from stoppage of the wheel by sticks working through the screens endwise and clogging the wheel. It is interesting to note that this wheel was rated at 25 horsepower and that the load is now carried by a 7.5 and a 5-horsepower motor with excellent results. The use of the leather punches would appreciably affect the speed of the water wheel which was the cause of ruining a large amount of product going through the various machines. It is still further interesting to note that from an actual test during excessive production the motors were operating at a 100 per cent overload without appreciable damage or variation of speed. There is a 7.5-horsepower and a 5-horsepower motor as previously stated, both operating at 1,800 revolutions per minute and equipped with five-inch pulleys. The smaller motor is not used at present but will be as soon as proper machinery is placed in the old shoe department. For finishing the leather gaskets there are nine cup machines, two hand operated and seven pneumatically operated. These machines are similar in appearance to a small lathe. The ordinary chuck is replaced by the female die and the male die is placed in the tail stock. The blanks are punched by hand and consist of leather disks with a hole in the center. The disk is placed over the point of the male die and by hand pressure or pneumatic pressure is forced into the female die which revolves at a high rate of speed. There is a small knife on a swing lever which is used to trim the edge of the gasket. Each of these machines has a capacity of about 8,000 gaskets daily. The leather before punching is run through splitters of which there are four. These trim the material to a uniform thickness. There is also in this department several machine tools for making dies and a surface planer for finishing the surfaces of the cutting blocks on which the hand dies are used. There is also a machine which cuts thick felt into strips and some miscellaneous machines which are enumerated in the accompanying table.

Jewell Manufacturing Company.

The product of this company is thermostats for the control of steam, hot-water and hot-air systems. The thermostat consists of a compound metal strip known as the blade which is platinum tipped and extends between two platinum-pointed screws. When expansion caused by increased heat occurs, contact is made with one of the screws which releases the motor and the drafts are closed to check the heater. When the room cools, contact is made with the other screw and the drafts are opened. The motor, or that part of the mechanism which operates the

Electric Drive in Ignition Plant.

dampers or valves is made in four models: Gravity motor for use with all types of coal burning heaters; spring motor for use with quick opening gas or steam valves; 110-volt motor and battery motor. There is a clock attachment for the thermostat so that night and day temperatures can automatically be obtained. In such instruments there are a large number of small parts requiring small machinery and delicate workmanship. The machine tools as listed in the accompanying table are group-driven by a five-horsepower motor running at 1,800 revolutions per minute, with an eight-inch pulley. It will be noted that there are a number of multiple-spindle drills. These are of especial value for small manufacturing as a number of holes can be bored in a part at one time, effecting a considerable saving.

To show the extent to which individual motor drive is used, in the experimental department there is a one-thirtieth-horsepower motor driving an experimental lathe. The motor equipment is completed by a two-horsepower motor driving a cross-cut saw and a one-horsepower motor driving a printing press and a multigraphing machine.

Auburn Ignition Manufacturing Company.

The product of this company is spark plugs for gas and gasoline engines of all types. As may be imagined the work on such appliances has to be of the most accurate character to withstand the severe pressure and to insure proper ignition. There is a group of machines driven by a five-horsepower motor operating at 1,800 revolutions per minute, consisting of two small engine lathes, three small turret lathes, two No. 13 Bliss punches, one power hack saw, small planer, drill press and two emery grinders. In addition there are two sensitive drills each individually driven by a 0.25-horsepower motor.

MOTOR DATA.

No.	H. P.	Kind of Drive.	Speed R. P. M.	Pulley Dimen., Inches.	Application.
National Rug Company.					
1	5	Group	1800	4	Two rotary fraying machines.
Auburn Leather Goods Company.					
1	7½	Group	1800	5	Two hand cupping machines, seven compressed-air cupping machines, four leather splitters, single sole moulder, heel cutting machine, thick felt cutting machine, air compressor, two small engine lathes, emery wheel, small drill press, surface planer.
1	5	Group	1800	5	Group sewing machines.
Jewell Manufacturing Company.					
1	1/30	Belt	....	..	Experimental lathe.
1	2	Belt	1800	..	Cross-cut saw. Printing press and multigraph.
1	5	Group	1800	8	Three-spindle drill, two 2-spindle drills, drill press, two small punches, medium engine lathe, two turret lathes, speed lathe, small shaper, sensitive drill, four emery grinders, small milling machine, tapping machine, power hack saw.
Auburn Ignition Manufacturing Company.					
1	5	Group	1800	5	Two small engine lathes, three small turret lathes, two Bliss No. 13 punches, power hack saw, small planer, small drill press, two tool grinders.
2	¼	Belt	....	..	Two small drills.

Surplus Electric Power of Street Railways for Factory Use.

At a recent hearing at Boston on the cost of furnishing street railway service to workingmen, at which figures were presented to show that the cost of this class of business, coming at the times of peak load on the system, costs the transportation company more than for service furnished the rest of the day, Chairman Macleod of the Public Service Commission suggested that surplus energy generated by a railway company be used by factories, these being operated after the workmen have been delivered to the mills and closing before the evening rush homeward begins.

Predicts Wider Use of Energy in Chemical Manufacture.

The advantage of cheap hydroelectric energy in the manufacture of chemicals was pointed out by Clarence W. Marsh, of Boston, in a paper read before the annual meeting of the Maine Society of Civil Engineers at Augusta, February 2. The following facts were brought out: Scientific manufacture of chemicals has been forced on this country by the European war. The basic conditions for successful manufacture of these products are cheap transportation of raw materials and finished product and cheap power. Each new electro-chemical industry locating in Maine will bring a customer for water power hitherto wasted. These powers should be increased by means of storage basins and the regulation of stream flow by the state and by vested interests.

"Electrochemical and electrometallurgical industries are Maine's opportunity," said Mr. Marsh.

Performance of Electrical Machinery.

Miles Walker brought forward for discussion at the Institution of Electrical Engineers in London, a paper on "The Predetermination of the Performance of Dynamo-Electrical Machinery." He began his paper by showing that it was designed to open a discussion on general methods of calculating dynamo-electric machines, and he gave an outline of a method which was applicable to all types of such machines, whether alternating-current or continuous-current generators or motors, or rotary converters. Simple rules were given for determining the various quantities upon which the performance of a machine depends; in particular, the method of arriving at a temperature rise which might be expected was more completely developed than in a previous paper by himself and H. D. Symons. The appendices to the paper were longer than the paper itself and they covered the following matters: plotting the field-form of a cylindrical field, magnet with highly saturated taper teeth; the calculation K_o (a coefficient for alternator-electromotive force; calculation of the magnetizing current; armature reaction; losses in copper and iron; predetermination of temperature rise.

Introducing Electricity on the Southern Farm.

Even in the South where the farms are few and large, electricity is beginning to make headway.

The accompanying illustration shows a 10-horsepower motor operating an ensilage cutter at a dairy near Taylor, Texas. This motor is used only during certain seasons of the year but other miscellaneous uses of electricity around the dairy makes the business worth while to the central station. Energy is supplied by the Texas Power & Light Company.

Motor-Driven Threshing Machine.

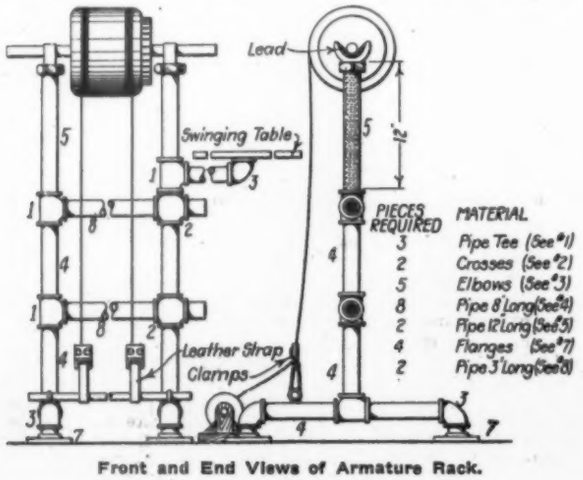
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Convenient Armature-Winding Rack Made of Pipe and Pipe Fittings.

In the accompanying illustration is shown a horse or rack for use in armature winding that is made entirely of standard pipe and pipe fittings. It is easily assembled and I have found it to be very convenient. It can be made to support practically any ordinary size of armature. The horizontal pipes *No. 8* are made to pass readily through the crosses *No. 2;* this is done either by boring out the crosses or by slightly turning down the outside of the pipes *No. 8.* In this way the horizontal length of the rack can be adjusted to suit the conditions. The stems which fit into the top uprights *No. 5* are made adjustable by being threaded and fitting over nuts. By this means the armature can be raised or lowered to the most convenient height for working upon it, and the back end of the armature can be made higher than the front when it is desired to solder in the leads so that the solder will flow to the front of the commutator and thus eliminate the danger of short-circuiting the latter. The crescent-shaped supports for the armature shaft should be lined or covered with sheet lead, babbitt metal or similar soft bearing surface to keep from scratching the shaft. The swinging table shown at the right of the front view can be easily swung towards the commutator and used for supporting tools or a blow torch for melting solder out of the commutator.

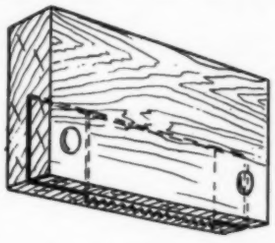
For banding the armature, eye-bolts are placed in the back part of the supporting legs; between them runs a rod upon which is slipped a strap that holds the tension block. The tension being straight down from the armature, the latter can not shake and maintains a fixed, steady position. After starting to put on the band wire an occasional tap of the hammer given to the bar on the tension block will cause the wire to fit on the armature nicely. The tension block is made of two pieces of fiber bolted together; the piece that receives the strap is about one inch longer so that in placing the wire between the two parts of the block the strap does not interfere with the wire. In the front view of the outfit, two separate tension blocks and banding arrangements are shown. Usually one is sufficient, however. Instead of using regular pipe elbows, service ells can be used. W. D. Wilson.



Front and End Views of Armature Rack.

Commutator-Slotting Tool.

For slotting commutators the use of a hacksaw has frequently been advocated. In every case of this kind that I have read or heard of, the block for holding the blade is too large and the outfit can be used only after removing the entire brushgear. I have found that a good and handy tool for cutting down high mica between commutator segments which overcomes the difficulty mentioned can be made as follows:



Small Slotting Tool.

Take a piece of hacksaw blade two inches long, a piece with fine teeth is preferable, and grind it down, if too thick to go between the segments. Next take a piece of wood three inches long, 1.5 inches wide and 0.75 inch thick and saw a slot the length of it with a hacksaw deep enough so that the two-inch piece of saw protrudes one-thirty-second inch, or more if desired, when it is inserted in the slot. Bore a hole through the wood piece on each end of the piece of saw, as shown in sketch, put in stove bolts and tighten. This tool can be used on a commutator without removing brushgear or end casting. R. F. Cooke.

Cleaning Machines Without Benzine.

Bearings and other unpainted parts of machinery that is stored away or shipped are usually protected by a heavy grease to prevent rusting. This grease is commonly removed by means of benzine, benzol or gasoline. The increasing cost of these lighter oils has called attention to another method, which is quite as satisfactory and probably cheaper. On account of scarcity of light oils in Germany, the following practice is being officially recommended:

The parts of machines should be boiled in soda lye, then brushed while the lye is still hot, and afterwards rinsed in hot water. Caustic soda is recommended as better than ordinary soda since it causes the fat or grease to dissolve more quickly. In order to dry the hot parts it is generally only necessary to let the remaining particles of water evaporate.

Use Electric Drill for Turning Down Small Things.

If it is desirable to turn down the head of a screw or make the diameter of a rod smaller, when no lathe is available, this can be done by chucking same in an electric drill, starting the drill and using a file as a turning down tool.

This scheme can be used for turning down a great number of things, such as washers, nuts, etc., if a means is found to chuck them. I have found this to be very much more rapid and to make a much smoother and neater job than filing by hand. F. C. Petersen.

Analysis of Changes in 1915 Electrical Code

After each biennial revision of the National Electrical Code every one interested in electrical construction (architect, engineer, contractor and inspector) must make a careful study of the changes made in the Code. Such a study of the changes incorporated in the 1915 edition of the Code recently published is greatly facilitated by the complete analysis thereof made by Washington Devereux, director of the Electrical Department of the Philadelphia Fire Underwriters' Association, and his assistants. For this valuable analysis, which is published herewith, the thanks of the electrical industry are hereby publicly expressed to Mr. Devereux and his staff.

Rule 1, section c, paragraph 2.—Changed to give the preference to grounding over insulating the base frames of generators operating at a potential of 550 volts or less.

Rule 1, sec. c.—Fine-print footnote, referring to insulated platforms surrounding high-potential machines, omitted.

Rue 4, sec. b, par. 2.—"Receptacles" changed to "sockets".

Rule 8, sec. a, par. 2.—Changed to give the preference to grounding over insulating the base frames of motors operating at a potential of 550 volts or less.

Rule 8, sec. b, par. 2.—Changed to omit "unlined" conduit and requiring all apparatus and wire to be completely enclosed in grounded shields or casings, the conduit to enter and be secured to such casings or terminal boxes.

Rule 8, sec. b, par. 3.—Transferred from Rule 8, sec. b, par. 6. No change in rule.

Rule 8, sec. b, par. 4.—Transferred from Rule 8, sec. b, par. 7. No change in rule.

Rule 8, sec. b, par. 5.—Changed from "Motor leads or branch circuits" to "Conductors carrying the current of only one alternating-current motor," and the paragraph transferred from Rule 8, sec. b, par. 3.

Rule 8, sec. b, par. 6.—Changed from "alternating-current motor leads or branch circuits" to "the current of only one varying (or variable) speed motor." The table for "Classification of services" changed as follows: Motors operating tool heads reduced from 200 per cent to 120 per cent. Rolling tables increased from 120 per cent to 180 per cent. Hoists, rolls and ore and coal-handling machines reduced from 180 per cent to 150 per cent. Freight elevators and shop cranes reduced from 160 per cent and passenger elevators from 140 per cent to 120 per cent.

Rule 8, sec. c, par. 1.—Rated capacity of fuses for circuits on which small motors are grouped, increased from "6 amperes" to "10 amperes or 660 watts."

Rule 8, sec. c, par. 2.—"Motor-starting rheostat" changed to "Motor-starting device."

Rule 8, sec. c, par. 5.—Changed from permitting rubber-covered wires for leads or branch circuits of alternating-current motors of the types requiring large starting currents to be fused in accordance with Table B of Rule 18, to "Conductors carrying the current of only one alternating-current motor" and adding, "The rated continuous current capacity of a time-limit circuit-breaker protecting a motor of the above type need not be greater than 125 per cent of the motor current rating, provided the time-limit device is capable of preventing the breaker opening during the starting period."

Fine-print note and table added giving percentage of the full-load currents of motors started by means of autostarters.

Rule 8, sec. h, par. 2.—The words "alternating current" omitted.

Rule 11, sec. b, par. 2.—Changed to require instrument transformers used exclusively to supply current to switchboard instruments to be grounded unless installed and guarded in all respects as required for the higher-voltage circuit connected to them.

Rule 12, sec. b, par. 2.—Changed to permit multiple conductors for service line wires secured to strain insulators spaced not less than one foot from adjacent woodwork and secured to petticoat insulators. Also eliminates the use of wood blocks for the support of insulators.

Rule 12, sec. c, par. 1.—Changes the height of wires over flat roofs from 7 to 8 feet and recommends the use of poles independent of the buildings for the support of wires crossing roofs.

Rule 12, sec. f, par. 3.—New. Describes how service conduits shall enter a building and how they shall be grounded.

Rule 12, sec. f, par. 4.—New. Describes how service conduits shall enter and be secured to fittings and be treated before ground clamps are attached.

Rule 12, sec. f, par. 5.—New. Requiring connections to grounded pipes and conduits to be exposed to view or accessible.

Rule 12, sec. f, par. 6.—Requiring ground wires to be at least No. 6 B. & S. gauge where the largest wire in the conduit is not greater than No. 0, and at least No. 4 B. & S. gauge when the largest wire is greater than No. 0.

Fine-print note added calling attention to the fact that the ground on the conduit system is not to be considered as a ground for the secondary system. (See Rule 15.)

Rule 12, sec. h.—Addition to require the metal sheaths of cables to be grounded approximately every 500 feet.

Rule 15, sec. a, par. 2.—Requiring the neutral wire to be grounded at each distributing box through the box or on the individual service as provided in sections c to g, inclusive.

Rule 16, sec. h.—New. Requiring the neutral wire of three-wire (not three-phase) systems to be of sufficient capacity to carry the maximum current to which it may be subjected.

Rule 17, sec. d.—Additions. Prohibiting underground services from a subway to a building or any service from a private generating plant from supplying more than one building except by special permission, unless properly protected by fuses and carried outside all the buildings but the one served. Conductors in conduit or duct under two inches of concrete under a building or buried two inches back of concrete or brick walls are considered as outside the building. Exceptions made to factory yards or buildings under a single occupancy or management.

Rule 18, Table.—Misprint. Under B. & S. gauge. Three naughts (000) instead of four naughts (0000) should follow two naughts (00).

Rule 19, sec. a, par. 2.—Addition. "In two or three-phase three-wire circuits and two-phase four-wire circuits there must be a trip-coil in each of two phases, and in four-wire three-phase circuits there must be a trip-coil in each phase."

Rule 19, sec. b, par. 1.—Changed to require switches, cutouts, circuit-breakers, etc., exposed to inflammable gases or dust or flyings of combustible materials, to be mounted in approved cabinets or cutout boxes, exceptions being made to oil switches, circuit-breakers and similar devices which have approved casings. (This embraces a portion of Rule 19, sec. b, par. 2 of the 1913 Code.)

Rule 19, sec. b, par. 2.—New. Requiring cabinets and cutout boxes to be of metal when used with metal conduit, armored cable or metal molding.

Rule 19, sec. c.—Changed to require cutouts, switches, etc., exposed to moisture as in basements and similar places to be mounted in approved cutout boxes or cabinets, and in wet places or outside of buildings to be mounted in approved weatherproof cutout boxes or cabinets.

Rule 19, sec. d.—Changed to except sign flashers mounted as described in Rule 83, sec. b.

Rule 19, sec. e.—New. Calling attention to Rule 70 for specifications of spacings between walls of cabinets and cutout boxes and current-carrying parts of devices.

Rule 20.—New fine-print note added at heading prohibiting constant-current systems inside buildings except by special permission.

Rule 23, sec. a, par. 2.—Changed to except knife-blade switches mounted in approved boxes or cabinets in the requirement for fuses to protect the switch.

Rule 23, sec. a, par. 3.—Changed to prohibit a fuse or circuit-breaker in any permanently grounded service wire.

Rule 23, sec. b, par. 2.—Changed to prohibit a fuse or circuit-breaker in any permanently grounded wire except as called for in section d.

Rule 23, sec. c, par. 2.—Addition to require a space of at least two inches between open-link fuses and metal or metal-lined or glass-paneled doors of cabinets or cutout boxes.

Rule 23, sec. d, par. 1.—Changed to include 16 medium-size or 25 candelabra-size sockets or lamp receptacles.

Rule 23, sec. d, par. 3.—Addition to include 25-watt rating for candelabra-size sockets.

Rule 23, sec. d, par. 4.—New. Permitting receptacles for attachment plugs rated not over 660 watts to be connected to ordinary branch circuits and rating such receptacles as requiring not less than 40 watts. Also permitting heating or other appliances rated not over 660 watts to be connected to such receptacles when the normal load in use at any time will not exceed 660 watts. A cutout must be provided for each receptacle rated above 660 watts.

Rule 23, sec. e, par. 1.—Changed to conform to Rule 8, sec. e.

Rule 23, sec. e, par. 2.—New. Permitting the use of approved enclosed fuses in multiple for the protection of wires having safe carrying capacity exceeding the rated capacity of the largest approved enclosed fuse. This does not apply to motor circuits.

Rule 23, sec. e, par. 3.—Transferred from Rule 23, sec. e, par. 2.

Rule 24, sec. a, par. 2.—Addition. Service switches must indicate plainly whether they are open or closed.

Rule 24, sec. b, par. 3.—Omitted.

Rule 24, sec. d, par. 2.—New paragraph embracing a portion of Rule 24, sec. d, par. 1 of the 1913 Code, requiring receptacles to be in especially designed boxes, unless by special permission where moisture is improbable or they are not subject to mechanical injury.

Rule 24, sec. e.—Rule confined to method of supporting switches. The word "fixtures" omitted. See Rule 30, sec. a, par. 5 for method of supporting fixtures not attached to gas pipes, conduit or other approved fittings.

Rule 25, sec. a.—Addition to latter part to conform to Rule 23, sec. d, par. 4.

Rule 25, sec. b.—Reference changed from Rule 54, sec. d to Rule 51, sec. k.

Rule 25, sec. f.—The words "or in volts and watts" added.

Rule 26.—Heading changed to include "or between any wire and the ground" after "a difference in potential between any two wires."

Rule 26, sec. a.—Changed to require wires, except in metal conduit, armored cable or metal molding to enter cabinets, cutout or junction boxes by means of non-combustible, non-absorptive, insulating bushings. For concealed knob-and-tube or open work in dry places approved flexible tubing permitted in wooden cabinets.

Rule 26, sec. e, par. 2.—Protection of wires on side walls changed from five to seven feet.

Rule 26, sec. g.—Rubber-covered wires changed to type letters R. S. for wires smaller than No. 6 B. & S. gauge and R. D. for wires of No. 6 or larger.

Rule 26, sec. k.—Rubber-covered wires changed to type letters R. S. for wires smaller than No. 6 B. & S. gauge and R. O. for wires of No. 6 or larger.

Rule 26, sec. l.—Changed to limit the number of wires in metal molding to four No. 14 B. & S. gauge and not more than 1,320 watts to be connected to a single circuit.

Rule 26, sec. n, par. 1.—Rubber-covered wires changed to type letters R. D. for twin, twisted-pair or multiple-conductor cables and for all single conductors of No. 6 and larger.

Rule 26, sec. n, par. 2.—New. Permitting slow-burning insulation for wires in conduits in permanently dry locations where excessive temperatures are present, by special permission.

Rule 26, sec. o, par. 3.—First method of supporting cables in vertical conduits changed to "approved clamping devices consisting of or employing insulating wedges inserted in the ends of conduits."

Rule 26, sec. q.—Rubber-covered wires changed to type letters R. S. for wires smalled than No. 6 B. & S. gauge and R. D. for wires of No. 6 or larger.

Rule 26, sec. v, par. 1.—Transferred to Rule 30, sec. c and references changed from No. 55 to No. 52 for construction of fixture wire.

Rule 26, sec. v, par. 2.—Transferred to Rule 30, sec. c, par. 2.

Ruel 26, sec. w.—Transferred to Rule 30, sec. d.

Rule 26, sec. x.—Transferred to Rule 30, sec. e.

Rule 26, sec. y.—Transferred to Rule 30, sec. f.

Rule 27, sec. c, par. 4.—The words "to which the wires must be soldered" omitted.

Rule 28, sec. f, par. 4.—The words "to which the wires must be soldered" omitted.

Rule 28, sec. g.—Changed to permit junction boxes in attics which have sufficient headroom but which are reached only by a portable ladder and permanent hatch.

Rule 28, sec. l.—New. Tables for size of conduits for installation of wires and cables.

Rule 29, sec. d, par. 4.—The words "to which the wires must be soldered" omitted.

Rule 30.—Reference changed: 24e, 26v to y and 55 omitted, and reference to construction rules No. 52 added.

Rule 30, sec. a, par. 5.—New. Describes the method of supporting fixtures not attached to gas pipes or conduit, unless outlet boxes or other approved fittings are used. Formerly covered in 24e.

Rule 30, sec. c.—Changed to specify size of fixture wire; reference to construction rules No. 52 added. Former rule transferred to Rule 30, sec. e, par. 2.

Rule 30, sec. c, par. 2.—Transferred from Rule 30, sec. d.

Rule 30, sec. d.—Transferred from Rule 26, sec. w.

Rule 30, sec. e.—Transferred from Rule 26, sec. x.

Rule 30, sec. e, par. 2.—Transferred from Rule 30, sec. c.

Rule 30, sec. e, par. 3.—New. Requiring chain fixtures to be wired with flexible conductors.

Rule 30, sec. f.—Transferred from Rule 26, sec. y.

Rule 30, sec. g.—New. Requiring fixtures to be tested for grounds or short-circuits before being connected to supply conductors.

Rule 31, sec. c, par. 1.—Changed to require sockets and receptacles, installed over especially inflammable stuff or exposed to flyings of combustible material, to be of the keyless type and, unless individual switches are used, to be at least 7.5 feet above the floor, or so located or guarded that the lamps cannot be readily backed out by hand.

Rule 31, sec. c, par. 2.—New. Permits departure from rule by special permission.

Rule 32.—New. Reference changed from No. 54 to No. 51.

Rule 32, sec. d, par. 1.—Addition to include "or other portable devices."

Rule 32, sec. d, par. 3.—Changed. Referring to guards, the word "wire" omitted.

Rule 32, sec. e.—Changed to permit the use of approved portable cord in show windows for the purpose of supplying current to portable lamps or other devices for exhibition purposes. Also permits the use of flexible cord for chain fixtures.

Rule 32, sec. g.—Changed to require flexible cords to be so connected as to relieve the strain from joints or binding screws.

Rule 32, sec. h.—New. To prohibit the use of so-called hard rubber or composition bushings threaded in outlet-box covers.

Rule 33, sec. e.—Transferred from No. 35.

Rule 35.—New. Requirements for the wiring and installation of gas-filled incandescent lamps.

Rule 38, sec. c, par. 1.—Reference to Rule 3, for requirements for switchboards, added.

Rule 38, sec. c, par. 2.—New. Requiring dimmers to be "dead" when the switch controlling the circuit is open.

Rule 38, sec. d, par. 1.—Addition. Requiring at least one-half inch separation between the metal of the box and receptacle terminals.

Rule 38, sec. d, par. 2.—Changing the maximum number of sockets on a circuit from 26 to 32.

Rule 38, sec. e, par. 2.—Changing the maximum number of sockets on a circuit from 26 to 32.

Rule 38, sec. h.—"Ironclad" changed to "enclosed."

Rule 38, sec. j, par. 2.—Addition to require dressing-room lamp guards to be sealed or locked.

Rule 38, sec. k, par. 1.—Addition to specify "No. 20 U. S. sheet-metal gauge."

Rule 38, sec. p.—"Six amperes" changed to "ten amperes."

Rule 38, sec. q.—Addition to require fixtures to be securely fastened in place.

Rule 38, sec. t, par. 4.—New. Transferred from last sentence of Rule 38, sec. t, par. 3.

Rule 38, sec. u, par. 1.—Changed to omit the words "used as a part of a moving-picture machine." Addition to include reference to Rule 38, sec. k, par. 1, 2, 3, 4 and 6 and to require incandescent lamps to be suitably enclosed.

Rule 38, sec. u, par. 3.—The words "spring hinged" omitted from the last sentence.

Rule 38, sec. u, par. 7 (1).—Requirements for ventilating transferred to Rule 38, sec. u, par. 7 (1) and for openings to Rule 38, sec. u, par. 7, (3).

Rule 38, sec. u, par. 7 (2).—New. Including a portion of the former Rule 38, sec. u, par. 7 (1) and adding the specifications and requirements for vent pipes and exhaust fans.

Rule 38, sec. u, par. 7 (3).—Transferred from Rule 38, sec. u, par. 7 (1).

Rule 38, sec. v, par. 1.—New. Requiring all equipments to be expressly approved.

Rule 38, sec. v, par. 2.—New. Limiting the entire equipment to 660 watts.

Rule 38, sec. v, par. 3.—Transferred from Rule 38, sec. v, par. 1 and changed to require arc lamps to be constructed as far as practicable in accordance with Rule 38, sec. k, par. 1, 2, 3, 4, and 6, and incandescent lamps to be entriely enclosed.

Rule 38, sec. v, par. 4.—Requirement for asbestos mat under machine omitted. Transferred from Rule 38, sec. v, par. 2 and changed to require rheostats, transformers, switches and similar current-controlling devices to be attached to and form a part of the machine, have no live parts exposed and comply with the requirements of Rules 65 and 78 or 81, sec. a, b, c.

Rule 38, sec. v, par. 5.—New. Transferred from Rule 38, sec. v, par 3, the words "non-inflammable" changed to "slow-burning" and the maximum length and width omitted.

Rule 38, sec. v, par. 6.—New. Requiring machines to be so constructed that they cannot be used with the full-sized commercial moving-picture machines. Fine-print note added giving the width and perforations of commercial films.

Rule 38, sec. v, par. 7.—New. Requiring machines to be marked with the name or the trade-mark of the maker, volts and current rating and plainly marked: "For use with slow-burning films only."

Rule 40.—Addition to heading calling attention to the rules as applying to all cars or locomotives used for electric service, or which are equipped with electric circuits and operating on either high or low-potential systems.

Rule 40, sec. a, par. 1.—Changed to require the underside of car bodies constructed of combustible material to be protected with fire-resisting heat-insulating material.

Rule 40, sec. a, par. 2.—Changed to specify the protection over motor trucks.

Rule 40, sec. a, par. 3.—"Air-compressor motors" added, "fire-resisting material or sheet iron," changed to "non-metallic, fire-resisting heat-insulating material."

Rule 40, sec. a, par. 4.—Changed to require all conductors, except motor leads, leads over grid resistances, as provided for in sec. d, par. 7, on the underside of car bodies to be installed in approved conduit or approved totally enclosed fire-resisting ducts. Leads to be brought out of conduits or ducts through approved fittings.

Rule 40, sec. a, par. 5.—Omitted.

Rule 40, sec. a, par. 6.—Omitted.

Rule 40, sec. b, par. 1 (1).—Changed to omit reference to table in Rule 18. Size of trolley and resistance leads transferred to Rule 40, sec. b, par. 3.

Rule 40, sec. b, par. 1 (2).—Changed to prohibit the use of fixture wire.

Rule 40, sec. b, par. 1 (3).—Transferred from Rule 40, sec. b, par. 1, and changed to require heater circuit, arc-headlight and air-compressor circuit conductors to be at least 6,000 circular mils cross-section area and 4,000 circular mils cross-section area for lighting or other auxiliary circuits.

Rule 40, sec. b, par. 1 (4).—Changed to require the leads between car bodies and motors to be flexible and triple-braided.

Rule 40, sec. b, par. 2.—Transferred from Rule 40, sec. b, par. 5.

Rule 40, sec. b, par. 3.—Changed to specify means of securing cables to devices, except drum controllers.

Rule 40, sec. b, par. 5.—Omitted.

Rule 40, sec. b, par. 6.—Omitted.

Rule 40, sec. c, par. 1.—Transferred from Rule 40, sec. c, par. 2, and addition to require circuit-breakers and switches, including oil circuit-breakers and oil switches, to be of the approved type.

Rule 40, sec. c, par. 2.—Transferred from Rule 40, sec. c, par. 1.

Rule 40, sec. c, par. 3.—Changed to specify requirements for cutout and switch cabinets.

Rule 40, sec. c, par. 4.—Transferred from Rule 40, sec. c, par. 5, and changed to require circuits carrying constant loads to be fused according to table A of Rule 18.

Rule 40, sec. c, par. 5.—Changed to permit light, control, heater and auxiliary circuits to be taken off ahead of main power cutout provided each is separately fused.

Rule 40, sec. c, par. 6.—Changed to permit circuit-breakers to be housed in approved wood cabinets lined with fire-resisting material. The conduit carrying the wires to the cabinets to end just outside.

Rule 40, sec. c, par. 7.—New. Requiring a switch to cut out the third-rail shoe, when not in use, when power is derived from both third rail and overhead trolley.

Rule 40, sec. d.—Additional paragraph to fine-print note, referring to conduit boxes.

Rule 40, sec. d, par. 1 (1).—New. Requiring conduits, outlet and junction boxes to be of approved type.

Rule 40, sec. d, par. 1 (2).—Transferred from Rule 40, sec. d, par. 1 (1), and addition to require protection from wheel-wash and other causes.

Rule 40, sec. d, par. 4.—Changed to require conduit to be permanently and effectively grounded. (Exception sec. i, par. 2 omitted).

Rule 40, sec. d, par. 7.—New. Permitting conduit to be omitted for alternating-current motors carrying over 150 amperes when located wholly below the car body.

Rule 40, sec. e, par. 1.—Changed to require the use of "approved" molding and metal molding to be grounded.

Rule 40, sec. e, par. 2.—Omitted.

Rule 40, sec. e, par. 3.—Omitted.

Rule 40, sec. f, par. 1.—Changed to include "approved clusters."

Rule 40, sec. f, par. 2.—Changed to permit the use of non-metallic molding for circuits of 700 volts or less.

Rule 40, sec. f, par. 3.—Changed to require receptacles or clusters used with conduit or metal molding to be mounted on approved outlet boxes or other approved manner, and the exposed metal parts to be grounded.

Rule 40, sec. f, par. 4.—Changed to require receptacles or clusters to be mounted on hardwood blocks or fire-resisting insulating material when circuits are run in non-metallic molding.

Rule 40, sec. f, par. 5.—Changed to require headlight circuits to be in conduit when run under car bodies. Resistance to be well ventilated and mounted as specified in sec. a. Plugs and receptacles to be of approved type.

Rule 40, sec. f, par. 6.—New. Lamp or voltage regulators and controllers for axle-driven or power-driven generators for car lighting to be in approved cabinets ventilated.

Rule 40, sec. f, par. 7.—New. To require storage batteries for car lighting to be installed in approved manner.

Rule 40, sec. g, par. 1.—Addition to require metal enclosures to be thoroughly grounded.

Rule 40, sec. g, par. 2.—Changed to require panel heaters to be mounted in metal risers, set back at least four inches from front of seat.

Rule 40, sec. g, par. 2 (2).—Changed to reduce to two (2) inches separation when woodwork is protected by approved fire-resisting insulating material.

Rule 40, sec. g, par. 3.—Transferred from Rule 40, sec. g, par. 2.

Rule 40, sec. g, par. 4.—Transferred from Rule 40, sec. g, par. 3, and changed to require heating circuits to be run only in approved conduit and the connections to heaters to be protected from mechanical injury.

Rule 40, sec. h.—Heading changed to "auxiliary motor circuits."

Rule 40, sec. h, par. 1.—Changed to require motor frames to be thoroughly grounded and motors in confined space to be in approved metal box or wood box lined with one-quarter-inch fire-resisting material and ventilated.

Rule 40, sec. h, par. 2.—Transferred from Rule 40, sec. h, par. 1, and changed to require circuits under car floor to be run in approved metal conduit.

Rule 40, sec. h, par. 3.—Transferred from Rule 40, sec. h, par. 2, and changed to require air-compressor governor to be of enclosed type or enclosed in approved cabinet or box.

Rule 40, sec. i.—Heading changed to "Main circuit and devices."

Rule 40, sec. i, par. 1.—Changed to specify method of installing conductors between trolley base and cutout or breakers.

Rule 40, sec. i, par. 2.—Changed to specify method of supporting current collectors.

Rule 40, sec. i, par. 3.—Changed to require conductors between third-rail shoes on same truck to be supported in hardwood insulating molding or metal conduit. If in conduit to be fused as near as possible to contact shoe.

Rule 40, sec. i, par. 4.—Changed to require conductors on underside of car to be in approved conduit. Junction boxes or other approved fittings to be installed where branches are made. Main cables, between controllers, may be in cable boxes which may be of wood properly lined. Cables or power circuits to be in approved conduit where exposed under the car. Conduits terminating above the floor must project at least one inch.

Rule 40, sec. i, par. 5.—Changed to require motor leads leaving the motor shell to fit the shell snugly and be well bushed, to be supported on frame by hardwood or other approved cleats, and to be connected to cables with approved devices or in an approved junction box.

Rule 40, sec. i, par. 6.—Changed to require the insulation of resistance grids from frames and frames from supports, and where insulation is removed from conductors the base strands to be filled with solder to make them rigid.

Rule 40, sec. i, par. 7.—Changed to permit the insulating of frames of all electrical apparatus except main and auxiliary motors and transformers under the car.

Rule 40, sec. i, par. 8.—New. Requiring the grounding of metal casings and frames of the controllers when located above the car floor.

Rule 40, sec. i, par. 9.—New. Requiring sheet-metal guards when necessary to protect the resistance and other devices from wash, dirt, etc.

Rule 40, sec. j, par. 1.—Changed to require lightning arresters to protect main motor circuit and all auxiliary circuits and be connected ahead of all metal conduit or molding.

Rule 40, sec. j, par. 2.—Changed to require ground conductor to be at least No. 12 B. & S. gauge and to be protected from mechanical injury by means of fire-resisting or wood molding.

Rule 40, sec. j, par. 3.—New. Circuit for lightning arrester need not be run in metal conduit.

Rule 40, sec. k, par. 1.—Changed to require insulating joints in whistle or smoke pipes which project above the level of the car roof, or projecting portions of such pipes must be surrounded by a substantial guard or cage not in electrical connection with such pipes.

Rule 40, sec. k, par. 2.—Changed to require the grounding of all coal-burning heating devices and an insulating covering over hot-water tanks.

Rule 41, sec. a.—Transferred from Rule 42.

Rule 42.—New. Special rules to cover installation of all lighting, motor circuits, motors or other apparatus in garages.

Class D.—Heading covering Rules 49 to 57, changed to "Insulated wires, cables and cords." Heavy-type note added referring to examination, tests and labels before shipment and calling attention to Rules 49 to 57 as being only a summary of complete detailed rules for construction and tests of insulated wires and cords for use in conduit in accordance with requirements of Classes A to C, inclusive. Complete specifications may be obtained from the secretary of the Electrical Committee of the National Fire Protection Association. The words "specified standard," "as specified, etc.," have reference to the requirements of the complete specifications.

Rule 49, sec. a, par. 1.—Transferred from Rule 49, sec. b, par. 1, and changed to include cords.

Rule 49, sec. a, par. 2.—Transferred from Rule 49, sec. b, par. 2, and reference changed to Rule 57.

Rule 49, sec. a, par. 2 (1).—Transferred from Rule 49, sec. b, par. 1 (1), and changed to "the maximum working pressure or voltage for which the wire was tested or approved." Marking may be omitted for wires described in Rules 55, 56 and 57.

Rule 49, sec. a, par. 2 (2).—Transferred from Rule 49, sec. b, par. 1 (2).

Rule 49, sec. a, par. 2 (3).—Transferred from Rule 49, sec. b, par. 1 (3).

Rule 49, sec. a, par. 2 (4).—Transferred from Rule 49, sec. b, par. 1 (4).

Rule 49, sec. a, par. 2 (5).—Transferred from Rule 49, sec. b, par. 1 (5), and reference to Rules 50 to 57 omitted.

Rule 49, sec. b.—Transferred from Rule 49, sec. a, pars. 1, 2 and 3, and the words "specified standard" replacing the specifications and table omitted.

Rule 50.—Type letters of wires of different braids, insulations and voltages added to heading.

Rule 50, sec. a, par. 1.—New. Requiring individual conductors, whether stranded or solid, to be at least No. 14 B. & S. gauge.

Rule 50, sec. a, par. 2.—Transferred from Rule 50, sec. a, par. 1, and changed to "all conductors and individual wires of stranded conductors shall be tinned."

Rule 50, sec. b, par. 1.—Changed to require conductors to be insulated their entire length with a properly applied vulcanized-rubber compound.

Rule 50, sec. b, par. 2.—New. Requiring the insulation to be "of nominal thickness given in the following table."

Rule 50, sec. b, par. 3.—New. Table of thickness of rubber insulation for rubber-covered wires and cables in 64ths of an inch for different type letters.

Rule 50, sec. c, par. 1.—Transferred from Rule 50, sec. h, and changed to require all single-conductor rubber-insulated wires and cables to have a covering of fibrous material applied directly to the surface of the insulating wall, and reference to strength omitted.

Rule 50, sec. c, par. 2.—New. Requiring at least one braid for any single-conductor wire for sizes from No. 14 to and including No. 8 and at least two braids for all single-conductor cables larger than No. 8.

Rule 50, sec. c, par. 3.—Transferred from Rule 56, sec. b, and changed to require each individual wire in twin wires and twisted-pair wires to have a fibrous covering and in addition a braid enclosing the bunched conductors.

Rule 50, sec. c, par. 4.—New. Requiring one or more additional coverings of fibrous material or of lead "for certain special service conditions."

Rule 50, sec. c, par. 5.—New. Permitting tape as a fibrous covering, but not for the outer covering.

Rule 50, sec. c, par. 6.—New. Permitting lead covering to be applied to single or multiple-conductors, and requiring lead-covered multiple-conductor cable with more than two conductors to be spirally laid.

Rule 50, sec. c, par. 7.—New. Requiring, in all cases, the individual conductors in lead-covered cable to have a fibrous covering and, except for two-conductor cables with conductors parallel, to have a fibrous covering over bunched conductors.

Rule 50, sec. c, par. 8.—New. Requiring the thickness of lead covering to be that specified for cables for the various sizes and forms.

Rule 50, sec. d.—Changed to require tests on wires to be performed according to "Underwriters' Laboratories' standards for Rubber-Covered Wires and Cables." The following are the tests specified:

A. On the wire as a whole: voltage test; insulation-resistance test.

B. On test specimens: wrapping test; chemical tests; physical tests for recovery, stretch and tensile strength.

Note:—Detailed specifications omitted throughout Rules 49 and 50.

Rule 51.—Transferred from Rule 54 and reference changed from sec. l to k for cords for portable heating apparatus.

Rule 51, sec. a.—Transferred from Rule 54, sec. a, and entire paragraph transferred or omitted except that flexible cords "must comply with requirements of Rule 49, secs. a and b.

Rule 51, sec. b.—Transferred from Rule 54, sec. a, and specifications omitted.

Rule 51, sec. c, par. 1.—Transferred from Rule 54, sec. b, par. 1, and changed to require the insulation to consist of properly applied and properly vulcanized rubber compound complying with specified physical and chemical tests.

Rule 51, sec. c, par. 2.—Transferred from the latter part of Rule 54, sec. b, par. 1.

Rule 51, sec. c, par. 3.—Reference changed to Rule 51, sec. f.

Rule 51, sec. d, par. 1.—Transferred from the latter part of Rule 54, sec. a.

Rule 51, sec. d, par. 2.—Transferred from Rule 54, sec. c.

Rule 51, sec. d.—Table for outer coverings of flexible cords transferred from Rule 54, sec. c, and references in last column changed as follows:

Type letter C	reference for additional rules changed from	....54d	to 51e
Type letter CB & CC	reference for additional rules changed from	....54d	to 51e
Type letter P & PO	reference for additional rules changed from	....54e	to 51f
Type letter PS	reference for additional rules changed from	....54f	to 51f
Type letter CA	reference for additional rules changed from	....54g	to 51f
Type letter PA	reference for additional rules changed from	....54g	to 51f
Type letter PWp & PkWp	reference for additional rules changed from	....54g	to 51g
Type letter PAWp	reference for additional rules changed from	....54h	to 51g
Type letter T	reference for additional rules changed from	....54i	to 51g&h
Type letter B	reference for additional rules changed from	....54j	to 51g&i
Type letter E	reference for additional rules changed from	....54k	to 51g&j

Rule 51, sec. e.—Transferred from Rule 54, sec. d, and reference to cords being "moved about sufficiently to come in contact with surrounding objects" omitted.

Rule 51, sec. f, par. 1.—Transferred from Rule 54, secs. e and f, and reference to "appearance" omitted.

Rule 51, sec. f, par. 2.—Transferred from Rule 54, sec. e, par. 2.

Rule 51, sec. f, par. 3.—Transferred from Rule 54, sec. f, par. 2.

Rule 51, sec. g.—New. Permitting tape to be substituted for the inner braid.

Rule 51, sec. h.—Transferred from Rule 54, sec. i, pars. 1 and 3.

Rule 51, sec. i.—Transferred from Rule 54, sec. j, and omitting the mention of tape as the outer cover.

Rule 51, sec. j.—Transferred from Rule 54, sec. k, and omitting the mention of tape as the outer braid.

Rule 51, sec. k, par. 1 (1).—Changed to "must comply with requirements of Rule 49, secs. a and b, and Rule 51, sec. b."

Rule 51, sec. k, par. 1 (2).—Transferred from Rule 54, sec. l, pars. 2 and 3, and omitting detailed specifications for construction and tests.

Rule 52.—Tranferred from Rule 55 and reference to installation rules changed to Rule 30.

Rule 52, sec. a, par. 1.—Transferred from Rule 55, sec. a, par. 2, and reference to size of wire and Rules 54, secs. a to c and 50 omitted.

Rule 52, sec. a, par. 2.—Transferred from Rule 55, sec. a, par. 2, and changed to require certain fixtures (see Rule 26, sec. v) to be wired with approved slow-burning wire.

Rule 52, sec. a, par. 3.—Transferred from Rule 55, sec. a, par. 3.

Rule 52, sec. b.—New. Requiring fixture wire to comply with Rule 49, secs. a and b.

Rule 52, sec. c, par. 1.—Transferred from Rule 55, sec. b, and size of strands omitted.

Rule 52, sec. c, par. 2.—Transferred from Rule 55, sec. c.

Rule 52, sec. d, par. 1.—Transferred from Rule 55, sec. d, and changed to require the "insulation to consist of properly applied, properly vulcanized rubber compound complying with the specified physical and chemical tests."

Rule 52, sec. d, par. 2.—Transferred from the latter part of Rule 55, sec. d.

Rule 52, sec. e.—Transferred from Rule 55, sec. e, and test omitted.

Rule 53.—Transferred from Rule 56, changed to permit wires of type letters R.S. (No. 14 to No. 8, inclusive), R.D., R.S.L., or R.D.L. for conduit use. Details of construction and tests omitted.

Rule 54.—Transferred from Rule 57, reference to Rule 54 in heading changed to Rule 51, and changed to require armored cable to comply with specified tests.

Rule 54, sec. b.—Transferred from Rule 57, secs. a, par. 3, and b, par. 1, and changed to require strips used in forming the armor to be of specified thickness and, if of steel, to be protected against corrosion in an approved manner. Details of construction and tests omitted.

Rule 54, sec. c.—Transferred from Rule 57, sec. c, and changed to require the conductors to "comply with the requirements of rubber-covered wires or cords of the specified types and construction."

Rule 54, sec. d.—Transferred from Rule 57, sec. e, and reference to tags on coils omitted.

Rule 55.—Transferred from Rule 51.

Rule 55, sec. a, par. 2.—Transferred from Rule 51, sec. a, par. 1, and changed to require the thickness of the completed covering to be not less than that specified for rubber insulation of 0-600-volt rubber-covered wires. (See Rule 50, sec. b.) Table omitted.

Rule 55, sec. b.—Changed to require the insulation to comply with Rule 49, secs. a and b.

Rule 56.—Transferred from Rule 52.

Rule 56, sec. a, par. 2.—Transferred from Rule 52, sec. a, and requirements for the completed covering changed to that of rubber insulation of 0-600-volt rubber-covered wires. (See Rule 50, sec. b.)

Rule 56, sec. b, par. 1.—New. Requiring "slow-burning wire" to comply with the requirements of Rule 49, secs. a and b.

Rule 56, sec. b, par. 2.—Transferred from fine-print note of Rule 52, and reference to the compound omitted.

Rule 57.—Transferred from Rule 53.

Rule 57, sec. a, par. 1.—Transferred from Rule 53, sec. a, and specifications changed to "comply with the specified requirements."

Rule 57, sec. a, par. 2.—Transferred from Rule 53, sec. a, and changed to require the thickness of the completed covering to be not less than that specified for rubber insulation of 0-600-volt rubber-covered wires. (See Rule 50, sec. b.)

Rule 57, sec. b.—New. Requiring weatherproof wire, to comply with the requirements of Rule 49, secs. a and b.

Rule 57, sec. b, par. 2.—Transferred from fine-print note of No. 53a.

Rule 65, sec. h.—Latter part changed to require "heavy clamps or screw and washer connections with upturned lugs" for "switches designed for currents of 30 amperes or less." Transferred from fine-print note.

Rule 65, sec. l.—"Twenty-five per cent excess voltage" changed to "at rated voltage."

Rule 65, sec. k.—New paragraph after Table 5, permitting the minimum separation between parts of opposite polarity, to be that given in Table 4 when approved barriers are used.

Rule 65, sec. l, par. 2.—Changed to require sub-bases to be so designed as to separate the wires at least one-half inch from the surface wired over. They must be of non-combustible, non-absorptive, insulating material, except for use with wooden molding, where they may be of hardwood.

Rule 65, sec. s, par. 2.—Transferred from Rule 65, sec. s, par. 3.

Rule 65, sec. s, par. 3.—Transferred from Rule 65, sec. s, par. 4.

Rule 66.—Reference to test in heading, changed from sec. **d** to secs. **c** and **d**.

Rule 67, sec. j.—Addition to third paragraph of fine-print note, "except that in 125-250-volt systems with grounded neutral, the cutouts in two-wire, 125-volt branch circuits may have the spacings specified for not over 125 volts."

Rule 68, sec. f.—In table, "not over 250 volts, 0 to 30 amperes," the latter part "three-wire circuits and two-wire 125-volt or 250-volt circuits," omitted.

Rule 70.—Addition to heading to include "cutout boxes, circuit-breakers, feeder and circuit-branch panelboards, etc." Reference to installation rules, Rule 19, secs. b and **d**, changed to Rule 19, secs. **b** and **e**, and Rule 24, sec. **b** omitted. Heavy-type note added calling attention to the requirements as being but a partial outline, detailed specifications being obtainable from the secretary of the Electrical Committee of the National Fire Protection Association.

Rule 70, sec. a.—New. Requiring cabinets intended for enclosing feeder and circuit-branch panelboards and similar devices to be designed for either surface or flush mounting. When for the enclosure of apparatus connected within the cabinet to the wires of more than four circuits, they shall have a back wiring space or one or more side wiring spaces, side gutters or wiring compartments unless the wires leave the cabinet directly opposite their terminal connections, and must be of the weatherproof pattern when intended for installation out of doors.

Rule 70, sec. b.—Changed to define "cutout boxes" as "intended for enclosing single devices or combinations of devices connected within the cutout box to wires of not more than four circuits"; when intended for installation out of doors, they must be of the weatherproof pattern.

Rule 70, sec. c.—Transferred from Rule 70, sec. a, par. 1, and the details of construction omitted, a note being added to consult the detailed specifications.

Rule 70, sec. d.—Transferred from Rule 70, sec. a, par. 4.

Rule 70, sec. d, par. 1 (1).—New. Requiring an air space of at least one-sixteenth inch, except at points of support, between the base of the device and the wall of any metal cabinet or cutout box on which the device is mounted.

Rule 70, sec. d, par. 1 (2).—Transferred from Rule 70, sec. a, par. 1, and changed to require an air space of at least one inch between any enclosed fuse or current-carrying part, unless the door is lined with approved insulating material, or is of a thickness at least that of No. 12 U. S. gauge, when the air space must be not less than one-half inch.

Rule 70, sec. d, par. 1 (3).—Transferred from Rule 70, sec. a, par. 1.

Rule 70, sec. d, par. 1 (4).—Transferred from Rule 70, sec. a, par. 1, and changed to include gutter partitions, if of metal, of any cabinet or cutout box where the potentials do not exceed 250 volts, and where the potentials exceed 250 volts, the spacing to be increased to at least one inch.

Rule 70, sec. d, par. 1 (5).—Transferred from Rule 70, sec. a, par. 1, and changed to require cabinets and cutout boxes to be deep enough to allow the doors to be closed when 30-ampere branch-circuit panelboard switches having spool or composition handles, or when switches of combination cutouts are in any position, and when other single-throw switches are thrown open as far as their construction and installation will permit.

Rule 70, sec. d, par. 1 (6).—Transferred from Rule 70, sec. a, par. 4, and changed to require cabinets having one or more side wiring spaces, side gutters, or side wiring compartments to be furnished with covers, barriers, or partitions extending around or from the side or sides of all bases or groups of bases of the cutouts, circuit-breakers, or feeder and circuit-branch panelboards within the cabinet, and providing a close fit with the door, frame, or sides, so as to enclose these spaces, etc.; at sides where wires or cables are led from the cabinet at points opposite their terminal connections and other wires or cables are not placed, these covers, etc., may be omitted.

Rule 70, sec. d, par. 1 (6), No. 2.—When cabinets have back wiring spaces which are not entirely enclosed, covers must be furnished to provide equivalent enclosure.

Rule 72.—Addition to heading to include "lamp receptacles," and fine-print note omitted.

Rule 72, sec. a.—"Sockets" changed to "lamp-holding devices."

Rule 72, sec. e, par. 3.—Changed to require pendent sockets to have sufficient room in the cap for a knot in the cord without crowding. Reference to "the ordinary wireman" omitted.

Rule 72, sec. h.—The words "the parts to which wiring connections are made" substituted for "the connecting points for flexible cord." "Designed" substituted for "made" and the size of conductors omitted.

Rule 72, sec. p, par. 2.—Changed to require lead wires furnished as a part of sockets, and intended to be exposed after installation, to be approved stranded, rubber-covered wire not less than No. 14 B. & S. gauge (No. 18 B. & S. gauge for candelabra sockets), to be sealed and spaced at entrance to shell at least one-fourth inch in the clear from each other or from exterior metal parts of the socket. Fine-print note referring to porcelain sockets omitted.

Rule 72, sec. q, par. 1.—Changed to require inlet, if threaded, to have not less than three-eighths-inch pipe size for sockets not attached to fixtures.

Rule 72, sec. q, par. 2.—Changed from fine-print note and also to require sockets with threaded outlets to have a hold not less than $\frac{3}{4}$ inch in diameter for plain pendent cord, and $\frac{13}{16}$ inch for reinforced cord.

Rule 76.—Reference to installation rules omitted and note added to the heading calling attention to the requirements as "but a partial outline of the specified requirements," which are obtainable from the secretary of the Electrical Committee of the National Fire Protection Association.

Rule 76, sec. a.—Changed to require approved materials, both for metal and other parts, and including that for the exterior and interior surface finishing.

Rule 76, sec. b.—Reference to insulating material on exposed surfaces omitted.

Rule 76, sec. c.—Transferred from Rule 76, sec. e, and changed to require insulating joints to be threaded in an approved manner. Specifications and table omitted.

Rule 76, sec. d.—Transferred from Rule 76, secs. a, c and d, and changed to require tests for compliance with specifications for heat, leakage, dielectric strength, torsion and bending.

Rule 76, sec. e.—Changed to require each joint and stud to be marked with the name or trade-mark of the manufacturer.

Rule 77.—Reference to installation rules changed to Rule 30, and for the construction of fixtures to Rule 52.

Rule 77, sec. a, par. 1.—Changed to require materials other than metal or wood to be submitted for special examination.

Rule 77, sec. a, par. 3.—Transferred from Rule 77, sec. d, par. 2, and exception made in the case of wireways in glass, marble or similar materials.

Rule 77, sec. a, par. 4.—Transferred from Rule 77, sec. b, and changed to require arms to be secured to prevent turning by threading and soldering, brazing, threading locked by set screw, or an equivalent method.

Rule 77, sec. a, par. 5.—Transferred from Rule 77, sec. b, and changed to require screw joints of arms and stems to have not less than five threads, all engaging at fixture supports, fixture bodies, etc.

Rule 77, sec. a, par. 6.—Transferred from the latter part of Rule 77, sec. b.

Rule 77, sec. a, par. 7.—Transferred from Rule 77, sec. c, par. 2, and addition to require sockets attached to the metal of fixtures to have the threading locked by set screws, brazing, or an equivalent method.

Rule 77, sec. a, par. 8.—Transferred from the fore part of Rule 77, sec. d, par. 1, and additions to include sharp edges in wireways and at points where wires emerge from arms, stems, chains, etc.

Rule 77, sec. a, par. 9.—Transferred from the latter part of Rule 77, sec. d, par. 1, and additions to require suitable fittings to protect supply wires where they enter casings of fixture stems of either straight electric or combination fixtures.

Rule 77, sec. a, par. 10.—New. Requiring fixtures for installation outdoors or where exposed to moisture to be so constructed that water cannot enter the wireways, sockets or other electrical parts.

Rule 77, sec. b, par. 1.—New. Requiring conductors to be at least No. 18 B. & S. gauge.

Rule 77, sec. b, par. 2.—New. Calling attention to the following table for the allowable current-carrying capacity of copper wires (sockets and receptacles will be considered as requiring not less than 40 watts each).

New table giving the current-carrying capacity of wires of rubber and slow-burning insulation, sizes 18 to 12, inclusive.

Rule 77, sec. b, par. 3.—Transferred from Rule 77, sec. d, par. 3, and additions to require wires and flexible cords, when fixtures are externally wired, to be so secured as not to be cut or abraded by pressure of the fastenings or motion of fixture and to be protected from abrasion where passing through sheet-metal pans, canopies, etc.

Rule 77, sec. b, par. 4.—New. Requiring the conductors to be spliced or joined so as to be mechanically and electrically secure without solder, the joints to then be soldered (unless made with some form of approved splicing device) and covered with both rubber and friction tape. Splices and taps not to be made in arms or stems of fixtures.

Rule 77, sec. b, par. 5.—New. Requiring receptacles to be so installed as to prevent possible turning relative to the surface on which they are mounted.

Rule 77, sec. b, par. 6.—Transferred from Rule 77, sec. c, par. 2.

Rule 77, sec. c, par. 1.—Transferred from Rule 77, sec. b, and additions to state that the thickness of the unthreaded arms will depend on the method used, all the methods used to fasten arms or stems to be of equivalent strength to that of a threaded connection, such methods to be submitted for examination, test and approval. Tubing not to be kinked, flattened or cracked.

Rule 77, sec. c, par. 2.—New. Requiring canopies to be sufficiently large, except where outlet boxes are used, to permit the proper storing away of splices to fixture leads and to keep them clear of the grounded part of gas pipes.

Rule 77, sec. c, par. 3.—New. Requiring all methods of securing arms or stems to fixture supports to be of equivalent strength to that of a threaded connection.

Rule 77, sec. c, par. 4.—Transferred from Rule 26, sec. **v**, par. 2, and addition to require conductors used in wiring fixtures to be of approved fixture wire, flexible cord or approved rubber-covered wire, excepting that slow-burning wire, etc., must be used in wiring fixtures in which the wiring is exposed from the heat of lamps to temperatures in excess of 120 degrees Fahrenheit.

Rule 77, sec. c, par. 5.—New. Requiring the ventilating of fixtures to avoid exposing the wiring to high temperatures. The wiring, as far as possible, to be kept free from excessive temperatures.

Rule 77, sec. c, par. 6.—New. Requiring all electrical fittings to be of approved types.

Rule 77, sec. c, par. 7.—New. Requiring canopy insulators, if provided, to be of approved types and securely fastened in place, and adding specifications for same.

Rule 77, sec. d.—Transferred from Rule 77, sec. **f**, and changed to require each fixture (after wiring and assembly) to be tested with a 50,000-ohm magneto for short-circuits or grounds.

Rule 78, sec. a, par. 2.—New. Specifications for mounting rheostats, resistance boxes, etc., to the bases.

Rule 79, sec. a, par. 4.—Addition to require the marking of the proper oil level with the starter assembled when a visual oil indicator is used and the oil level prior to assembling when the visual indicator is not used.

Rule 81.—The words "nor to instrument transformers" added to the second paragraph of the fine-print note.

Rule 81, sec. a, par. 1.—"Secondary winding of bell or other signaling transformers" changed to "low-voltage windings as specified below," and requiring sheet-metal cases to be not less than 1/32 inch and cast-iron cases not less than ⅛ inch in thickness.

Rule 81, sec. a, par. 3.—New. Requiring that leads of approved cable at least six inches in length, and so secured as to prevent strain from coming on connections to coils, be brought out of the case through approved bushings, except in bell-ringing and toy transformers, the low-voltage terminals of which may be binding screws mounted on the case.

Rule 81, sec. a, par. 4.—Transferred from Rule 81, sec. **b**, par. 3.

Rule 81, sec. b.—"Primary and all secondary voltages" changed to "the high voltage and all low voltages."

Rule 81, sec. c.—Change in method of testing air-cooled transformers.

Rule 81, sec. d.—Addition to require "bell-ringing or other signaling transformers" to comply with the requirements of sec. **a**, and the following specifications.

Rule 81, sec. e.—Changed to require the marking, where it can be plainly seen after installation, with the name of the manufacturer, frequency, high voltage and all low voltages, in addition to the proper terminals being marked "line" and "bell." The rating of the high-voltage winding not to exceed 125 volts.

Rule 81, sec. f, par. 1.—Transferred from Rule 81, sec. **d**, par. 3, and the words "while the rated voltage is impressed on the high-voltage coil" substituted for the words "while 110 volts (60 cycles) are impressed on the primary."

Rule 81, sec. f, par. 2.—Transferred from Rule 81, sec. **d**, par. 4, and the words "high voltage" and "low voltage" substituted for "primary voltage" and "secondary," respectively.

Rule 81, sec. f, par. 3.—Transferred from Rule, 81, sec. **d**, par. 4, and the words "high and low-voltage coils" and "high-voltage coil and core" substituted for the words "primary and secondary coils" and "primary and the core," respectively.

Rule 81, sec. g.—New. Requiring toy transformers to be constructed in accordance with section **a** and the following specifications.

Rule 81, sec. h, par. 1.—New. Requiring toy transformers to be marked with the name of the manufacturer, high and low voltages and rated capacity in volt-amperes.

Rule 81, sec. h, par. 2.—New. Limiting the high-voltage rating to 125 volts and the low-voltage rating to 25 volts.

Rule 81, sec. i, pars. 1 and 2.—New. Specifying the tests of toy transformers.

Rule 83, sec. b, par. 3.—Changed to require transformers, unless of the weatherproof type, cutouts, flashers and other similar devices, to be enclosed in approved "cutout boxes or cabinets."

Rule 83, sec. e, par. 1.—The requirement for double-braided wire omitted.

Rule 90.—Note added to heading stating that "all wiring, apparatus, etc., not specifically covered by rules herein given must conform to the general requirements of the Code."

Rule 90, sec. a.—Addition to require protecting hand rails around generators.

Rule 90, sec. b.—Transferred from Rule 90, sec. **d**, and changed to require the capacity to be given in volts, amperes and kilowatts, and whether shunt, series or compound.

Rule 90, sec. c.—New. To require generators on storage batteries employed for auxiliary lighting or power to be located as far as practicable above the load water line.

Rule 91, sec. a.—Changed to require wires, except around generators, at switchboards and in wire tunnels, to be enclosed in approved metal molding, or conduits, unless covered with approved metal armor or metallic braid.

Rule 91, sec. b.—Addition to require wires to conform to requirements of Rules 49 and 50. All conductors larger than No. 12 to be stranded and no single conductor smaller than No. 14 to be used, except in fixture wiring.

Rule 91, sec. c.—Changed to prohibit conductors being spliced, except at fixture, unless special permission is given in writing.

Rule 91, sec. d.—New. Requiring splices and taps to be made by means of approved connecting blocks enclosed in approved fittings, except as provided for in Rule 91, sec. **c**, located in readily accessible places and not permitted in bunkers.

Rule 91, sec. e.—Changed to require deck tubes to extend at least 18 inches above the surface of the deck.

Rule 91, sec. f, par. 1.—Transferred from Rule 91, sec. **h**.

Rule 91, sec. f, par. 2.—New. Requiring pull boxes to be installed at sufficient intervals to permit the drawing in of conductors without undue strain. Pull boxes to be provided with gasketed water-tight covers, and the length of the opening in the box to be at least ten times the diameter of the largest conductor contained therein.

Rule 91, sec. g.—Transferred from Rule 91, sec. **i**, and changed to require additional mechanical protection, where passing through coal bunkers or where otherwise exposed to severe mechanical injury, when enclosed in metal molding, flexible metal conduit, metal armor, or metallic braid.

Rule 91, sec. h.—New. Requiring metallic braid cable, passing through beams or non-water-tight bulkheads, to be protected from abrasion. All sharp bends to be avoided.

Rule 92.—Changed to require portable conductors to be made of two or more stranded conductors, each having a carrying capacity equivalent to No. 14 B. & S. gauge or larger, and each provided with an approved insulation and covering. (See rule 51, sec. **d**, Type PWp.) Specifications omitted.

Rule 93, sec. a.—Addition to require bell or other signaling wires to be not less than No. 16 B. & S. gauge.

Rule 93, sec. b.—New. To require wires, if operated at a potential over 25 volts, or connected without specially approved transforming devices to a source of supply over 25 volts, to conform to requirements of Class C and Rule 19, sec. **a**, except that No. 16 B. & S. gauge conductors insulated as specified in Rule 55 may be employed.

Rule 93, sec. c.—New. Requiring all permanent wiring in radio room and above the top metal deck to be magnetically shielded. Any protection placed around antenna leads to be of metal permanently and effectually grounded.

Fine-print note added recommending the grounding of all metalwork above the top metal deck.

Rule 94, sec. a.—Transferred from Rule 95, sec. **a**, the word "approved" added, and the words "such as marble or slate" omitted. Table also omitted.

Rule 94, sec. b.—Transferred from Rule 95, sec. **b**.

Rule 94, sec. c.—Transferred from Rule 95, sec. **c**, "main cutout" changed to "automatic cutout."

Rule 94, sec. d.—Transferred from Rule 95, sec. **d**, and changed to require each circuit leading from the board to be protected by a cutout and controlled by a switch; section **e** referring to wires being omitted.

Rule 95, sec. a.—Transferred from Rules 97 and 98 and changed to require cutouts and switches, except on switchboards and in living spaces, to be enclosed in moisture-proof cases, arranged to break all poles of the circuit and not to be located in bunkers or other inaccessible places.

Rule 95, sec. b.—Transferred from Rule 97, sec. **c**, and changed to require each freight compartment to be separately protected and controlled.

Rule 95, sec. c.—Transferred from Rule 98, sec. **c**, and "metal cabinets" substituted for "cabinet lined with fire-resisting material."

Rule 95, sec. d.—Transferred from Rule 98, sec. **d**, the words "or other current-consuming devices" added after the word "lamps," and the word "ultimately" omitted from the last line.

Rule 96.—New. Permitting the use of removable fixtures and wiring in spaces allotted alternately to passengers and cargo. Main fuses and switches not to be located within these spaces.

Rule 97, sec. a.—Transferred from Rule 103 and addition to require each side of all signal circuits to be carried through the telltale board and fused at this point.

Rule 97, sec. b.—New. Prohibiting signal circuits from supplying other than pilot house and signal lights.

Rule 98.—Transferred from Rule 104, sec. **d**, and the words "and kilowatts" added after the word "amperes." Sections **a**, **b** and **c** omitted.

Rule 99.—Transferred from Rule 105 and changed to require the wiring in any vessel to comply with Rule 86. Reference to tests and table omitted.

Fine-print note added urging a complete test of the entire electrical equipment at least once a year.

CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Facilitating Customer's Development.

To the Editor:

In reference to the item on this subject which appeared in the issue of January 15, I take it for granted that the Nevada California Power Company is selling current on a high-tension form of contract and metering it at low tension, customer furnishing the transformers. Such a condition would be quite impossible with our company, and I cannot exactly see how any company can justify the practice of metering current on the low-tension side of the line, when the customer owns transformers.

It seems to me that they should either call their contract a low-tension contract, furnishing the transformers themselves and metering on the low-tension side, or else they should call it distinctly a high-tension contract and meter it on the high-tension side of the transformers. In other words, they have sort of an unusual condition without much justification for it.

It would seem to me if this company believe their rates are a little high, they should make a reduction in the rate itself, rather than making such an arrangement as outlined.

C. H. Stevens.
Edison Electric Illuminating Company of Brooklyn.

Brooklyn, N. Y.

To the Editor:

In regard to article entitled "Facilitating Customers' Developments by Carrying Transformer Losses," will say that with the exception of only a few customers, this company owns all of the transformers used in connection with the supplying of power service in Louisville. This being the case, we find it more efficient to install transformers of a capacity to suit their present requirements and change the transformers from time to time as the customers load increases. Of course, where an immediate increase is anticipated, transformers are installed of sufficient size to take care of same.

Robert Montgomery,
Louisville Gas & Electric Company.

Louisville, Ky.

Grounding of Secondaries.

To the Editor:

I have been advocating the grounding of secondary circuits for some fifteen years; therefore, the letter of Mr. C. H. Hill in your issue of January 15 interests me greatly.

In our advocacy of grounding or of non-grounding we are in danger of losing sight of relative values. He who supports one side of the controversy by claiming that grounding will banish the life hazard without increasing the fire risk is not a greater special pleader than he who argues that the life hazard is too nearly inappreciable to warrant the incurring of any extra fire risk whatever.

It is human lives against dollars, Mr. Editor! And we are now presented with inferential statistics as to fatalities and casualties; but no evidence is adduced by the insurance expert to prove how many *dollars* of fire loss might have been saved by non-grounding. Shall we assume the dollars lost by grounding to be "less than one-half of one per cent of actual" fire losses?

The advocates of grounding say that nearly all fatalities and casualties attributable to grounding might have been avoided —and statistics are available to show how many cases occur annually. The opponents of grounding say merely that it "automatically increases the fire hazard." Where are *their* statistics? Until we have them we shall not be able to arrive at an intelligent decision; for we must base the decision upon the price that is paid for saving a human life—and it might perhaps be that the price is too heavy, although this has not yet been proven. For, after all, human life has a definite average money value, notwithstanding what the moralists tell us.

Now, while it is undoubtedly true that the second fuse in an underground circuit furnishes additional protection, for how long does it do this? Our experience is that when we find a jumped fuse on one leg of a circuit, we find a jumped fuse on the other leg also. The tenant or the emergency man shows no such nice sense of discrimination as would allow him to jump the fuse first blown and deter him from jumping the other when necessity arose.

Might we not just as logically demand *two* safety valves on a steam boiler, on the plea that after a chunk of iron had been hung on the lever arm of one valve the second one would furnish protection (until the fireman found that he needed another chunk of iron)?

It would prove interesting if the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, with the exceptional facilities at its command, should secure statistics as to fatalities and severe casualties due to non-grounding, and actual fire losses in dollars due to grounding.

Assuredly, tests of ground connections ought to be made annually. I do not see, however, how any general rule of responsibility can be laid down, as court rulings on this subject vary throughout the country and other local conditions are important factors.

Hubert S. Wynkoop.
Department Water Supply, Gas and Electricity.

New York, N. Y.

To the Editor:

The field experience in Oakland to date has proven the advisability of grounding.

Prior to the enforcing of grounding one leg of the secondary system in this city, there were two deaths brought to my personal attention, one from turning on a key socket while standing in a bath tub and the other from coming in contact with a broken socket over a sink. These were on our old systems of 220-440 volts.

Since enforcing the grounding we have had three fires from burnt-out conduit services and in two cases the insulation was burnt off the ground wire, which was of No. 10 B. & S. gauge. However, in the above mentioned cases no damage was done to the buildings.

Mr. Hill's letter brought out the hazardous condition of bridging cutouts on a grounded system. Our local conditions in this section of the country may be different from that of eastern cities as the majority of residences are not piped for illuminating gas, therefore the risk of grounds on interior wiring is not as great. Furthermore in our fire district and small business centers we carry on a systematic resurvey inspection which we find is clearing up the practice of bridging cutouts. I also believe that this subject is of extreme importance and look forward to reading the views of others.

Our lighting system is all alternating current, 110-220 volts.

B. C. Hill,
Supervising Inspector, Electrical Department.

Oakland, Cal.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 331.—Small Lifting Magnet.—I am looking for a small solenoid magnet that can lift about one pound with a one-inch stroke; it must be wound for not over 20 volts. If no magnet of this kind can be readily secured on the market, I would like to have the necessary data for constructing it myself.—F. A. K., Los Angeles, Cal.

No. 332.—Electric Belts.—Does any recognized authority on electrotherapeutics find any curative value from the use of the so-called electric belts? Has their sale or exploitation ever been prohibited?—J. S. C., Dayton, O.

No. 333.—Electric Car Heating.—Has any system of electric heating been developed for electric street cars, elevated or subway trains, which gives a more uniformly distributed heat than the electric coils now commonly used under the seats? I have heard many complaints on very cold days that the seats are uncomfortably hot while the floor is chilly.—A. P. G., Chicago, Ill.

No. 334.—Locked Cutout Cabinets.—In a large drafting room lighted by adjustable drop lamps over each drawing table considerable trouble has been caused by a rule keeping the cutout cabinet locked with only the electrician in charge of the key. When a fuse blows due to trouble on any drop lamp, the circuit for several tables is dead until the electrician can be found in some remote part of the factory. What is the best solution for the difficulty without violating the rule?—N. L. P., Milwaukee, Wis.

No. 335.—Ground Detector for Transmission Line.—I would like to have data and sketch of a ground detector that is suitable for use on an 11,000 volt, three-phase, power transmission line that is six miles long. I wish to construct this detector myself.—R. F. C., Minersville, Cal.

Answers.

No. 322.—Jobbers' Trade Names.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

In the case of dry cells, commonly called "dry batteries," it is very usual for the jobber to have his own "brand" which is of just the same quality as the "standard" of the manufacturer, and the jobber sells both. In this case it is advantageous to the jobber and to the manufacturer. The jobber can sell a good product at a lower price, if he desires, having the manufacturer's permission to cut the price of the "brand" cell, while the "standard" cell is maintained in price, guarantee and reputation. In this case the manufacturer is a national advertiser, he has men traveling the whole country, his trade is not materially affected if the jobber puts his brand on some other make of cell.

Lets take another, the case of a manufacturer of telephone apparatus. He is not an advertiser and he has no travelers. He puts his own name on the best class of all his apparatus, in fact, he places it on all that he sells in small lots, but the bulk of his business is to jobbers selling under their own name to mail-order houses and to other manufacturers. The mail-order house has to sell under a different name from that of the jobber and it usually sells a cheaper grade, hence it usually gets more business. If the mail-order house "hooks up" with another manufacturer, it does not lose its "brand," but the maker of the first apparatus is separated from a large piece of business that he cannot recover. This particular manufacturer lost a contract of one car a day.

In still another case, a well known manufacturer of controlling devices for motors made a contract with a large motor manufacturer. Suddenly, at the expiration of one year's contract, the large motor manufacturer starts to make his own controlling devices with the lamentable result that the first factory found itself with an enormous investment in buildings and machinery for which it had no apparent use. Luckily it "pulled through" and is now one of the largest manufacturers of controlling devices in the country.

If you are making an article, or about to market one, you had better consult with a good commercial electrical engineer and abide by his decision.—R. L. L., Minneapolis, Minn.

No. 325.—Capacity-Factor of Central Station.—In a town of 10,000 or less, having a fair day load, the peak being composed of store and residence lighting, what is the proper ratio between peak load and rated capacity of the station? I am supposing that the central station makes little or no effort to increase the power load and absolutely no effort to push appliances.—F. H. G., Columbus, Neb.

If the plant consists of two or more generating units so that any one may be shut down for a while during the 24 hours and a careful inspection and adjustment made, as is generally the case with plants for towns of this size, so that units are kept in good condition and are reliable in themselves, a daily peak load, as described, of 115 per cent of rated capacity of plant can be handled with good economy and fair reliability. However, it is not advisable to reach the above ratio before considering additional equipment, for any sudden demand for service at this ratio might result in poor service for all and a hindrance to the electric development of the district.—J. F. F., Williston, N. D.

No. 326.—Automatic Electric Humidification.—Are any automatic means available through which an electric water-heater could be controlled from a humidity instrument so as to cause the heater to boil water when the relative humidity has dropped to, say, 30 per cent and be cut off when the humidity has been raised to 40 per cent? Would such a device be practical and reliable?—M. T., Lansing, Mich.

There should be no difficulty in securing a satisfactory controlling system of this kind as there are several humidity instruments on the market, which if slightly modified would answer the requirements. One, which would probably be satisfactory, is the Class III wet and dry-bulb recording thermometer or recording psychrometer manufactured by The Bristol Company, Waterbury, Conn. This instrument is designed for determining the actual percentage of humidity in the air. The recorder may be placed at some distance from the actuating part of the equipment, if necessary.

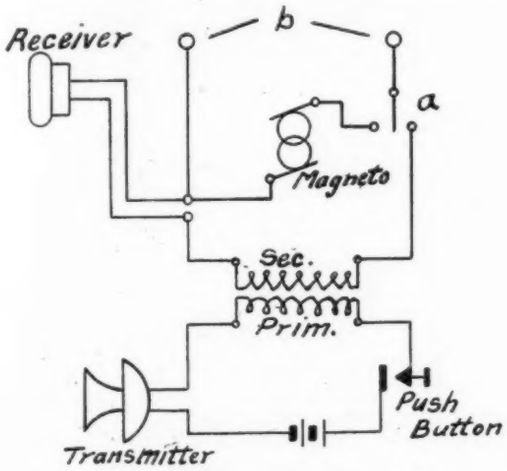
By adding two sets of contacts to the recorder hand or indicating pen, this instrument could easily be made to control the electric water-heater through the medium of a suitable relay, magnetically operated switch or contactor. One contact would be set to close the heater circuit when the relative humidity dropped to 30 per cent and to open the circuit when the humidity reached 40 per cent. The contacts could further be made adjustable so that any minimum or maximum value could be selected. The type of relay would depend entirely upon the voltage of the circuit and the amount of current required by the heater. It might be necessary to have two relays, one requiring a small amount of operating current, which would operate a larger relay, which would in turn directly control the heater circuit. The exact arrangement possible would depend upon the amount of current the contacts could be made to handle. It might further be possible to eliminate the recording part of this outfit and have the bulb part or actuating device simply close and open the relay circuit at certain predetermined maximum and minimum values. An outfit of this kind would, in my opinion, be practical and reliable as well.—G. A. S., San Francisco, Cal.

No. 327.—Reducing Glare from Table Lamps.—I have observed that practically all table lamps cause eye strain to children reading or playing on the table by shining glaringly directly into their eyes, if the children are not sufficiently tall to have their eyes screened by the shade or dome. Can anything be done to reduce this glare, aside from using full-frosted lamps?—P. M. C., Lockport, N. Y.

The full-frosted lamp would be the simplest way out of the matter. However, there is on the market a semi-indirect shade that can probably be used in this connection, but, of course, with reduced light. It is also possible to attach an inverted frosted or prismatic glass shade to some table-lamp fixtures, this also with reduced light, though this reduction is not disadvantageous when it comes at the expense of glare reduction. —P. B. W., Verbena, Ala.

No. 329.—Telephone Test Set.—Could an ordinary test magneto of 50,000 ohms be used for a telephone test set? If so, give description of plan for use and wiring diagram for attaching a head-type receiver and transmitter or a microphone set to the magneto to use in telephoning, also the batteries for the current. My idea was to use this temporary rig for use in testing transmission-line troubles on a small line of eight to ten miles in extent without a regular telephone system, the company not buying anything as expensive as a regular test set. Could it be used for talking to power house over one wire of transmission line (line dead), using a grounded return for six or eight miles?—C. D., Glenwood, Minn.

The ordinary magneto can be arranged for use as a telephone test set by equipping it with a high-resistance receiver, using



No. 329.—Diagram of Telephone Test Set.

a switch so that the magneto can be cut out of the circuit while talking and listening and the receiver cut out while ringing. Such a set is, however, not very satisfactory for talking, since when the receiver is used as a transmitter the voice currents are extremely feeble. Furthermore, if the set is to be used on one wire with a ground return there would probably be some disturbance from earth currents. A much better arrangement would therefore consist in using a transmitter with a local battery as shown in the accompanying sketch. The sketch also gives the connections and wiring.

The switch at *a* is wired so that when it is thrown to the left the set is arranged for ringing, and when thrown to the right it is connected for talking and listening. The push button controlling the battery circuit is normally open and should be closed only when the person using the set is talking. The switch and push button should be mounted on the outside of the set, and the latter should preferably be placed in a position such that the user can manipulate it with the hand used in holding the set.

The induction coil is of the local-battery type with a low-resistance primary and a high-resistance secondary and can probably be purchased from any telephone supply house. It should have a resistance of approximately two ohms in the primary and 25 ohms in the secondary. If desired a satisfactory coil can be made by winding 400 or 500 turns of No. 22 B. & S. gauge wire on a core of soft iron wire. The core should be about 0.625 inch in diameter and about 3.5 inches in length. This winding constitutes the primary. The secondary should consist of about 1,200 turns of No. 30 B. & S. gauge wire wound over the primary. Double-cotton-covered magnet wire is suitable for both the primary and secondary.

The battery should consist of two or three small dry cells. The multiple-cell units sold for small flashlight batteries would be adequate, but any two-cell battery, small enough to be mounted in the box containing the magneto, would be satisfactory. The transmitter should be mounted rigidly on the door of the box, and the receiver should be provided with 18 inches to 2 feet of flexible cord. A hook or clip should also be provided on the side of the box to hold the receiver when not in use.

The set described above can be used for talking over one wire with a ground return, unless there is an unusual amount of earth-current disturbance, as might be the case along a trolley road. Better results on the whole will be obtained by using the set on a two-wire basis. If desired, a small buzzer can be connected in the magneto circuit so that with the switch on the left contact, i. e. ringing position, a call can be received when the set is in circuit.

Leads should of course be provided of sufficient length to connect the set to the line using binding posts shown at *b* for the purpose.—H. S. P., New York, N. Y.

No. 330.—Installing Concentric Wiring.—In bending a sample of the new concentric wire in a certain direction, I notice that the seam in the outer sheath is easily opened. Is this not likely to cause short-circuits, if such wire is installed in damp places where water may enter the insulation at open seams? How can this be prevented?—L. T. K., Chicago, Ill.

If concentric wiring is to be used generally, there is no question but what the rules regarding its installation should be rigid and only men of experience and men having a thorough knowledge of it allowed to install it. The writer has a few samples of concentric wire and grounding devices, and on experimenting with them found that this wire is easily damaged and the outer sheath easily broken, if not handled right.

If the wire is bent with the seam on the inner side of the bend, it will open up or the seam will split open, which subjects it to trouble. In damp places the insulation between the inner conductor and the outer conductor becomes weakened which might result in leakage, short-circuit, or other trouble, according to the condition of the insulation. It should be bent with the seam on the outer side of the bend. The grounding should be done perfectly and the wire installed where it will not be subjected to any serious vibration.—W. T. E., Ansonia, Conn.

Concentric wire as it is manufactured at the present day is not adaptable for what is known as a water-tight installation, as is proven by the question in discussion.

Bending it in a certain direction the outer shield is opened and water easily gains admittance to the inner insulated wire. There lies one of the great dangers of concentric wiring. It will not take so very long for the water to penetrate the insulation sufficiently to cause heating. This cannot be termed as a "dead short" at this stage.

One way to overcome the condition of the outer shield opening is to use the type L Condulets equipped with stuffing glands where turns are to be made, and a type T can be conveniently used where a tap or branch is required. These glands are not a standard article but can be made up at a small cost in any machine shop and fit the one-half or three-quarter-inch Condulet threads, so all that is necessary is to screw them in the same way as one would a pipe. Concentric wiring cannot be recommended for wet places where a "water-tight" job really is the thing.—G. R. S., Brooklyn, N. Y.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Mogul Porcelain Socket with Iron Yoke.

For exterior illumination conditions frequently require a mogul-size porcelain socket that can be threaded directly to the end of a solid arm or bracket. For this purpose a yoke fitted to the socket has been found especially desirable. It gives abundant ventilation to the socket itself and provides liberal wiring space.

A socket of this type has recently been placed on the market by Harvey Hubbell, Incorporated, Bridgeport, Conn. This socket is provided with a cast-iron yoke tapped for three-eighths, one-half or three-fourths-inch pipe or rod, as desired. This design of the yoke permits ample room for the conductors to be strung from the socket to the feed wires instead of drawing them through conduit or the supporting arm of the fixture. The conductors are easily attached to the binding screws, which have especially large heads. The top of the porcelain is so arranged that the wires lead through an opening therein and thence diverge to either side of the bracket for attachment to the feeder.

Although designed primarily for use in exterior lighting, these new porcelain sockets have also been found desirable for use in interior wiring where large lamps are mounted in husks or inclosed sockets.

Mogul Socket with Yoke.

Electric Corn Popper.

Electrically Driven Corn Popper.

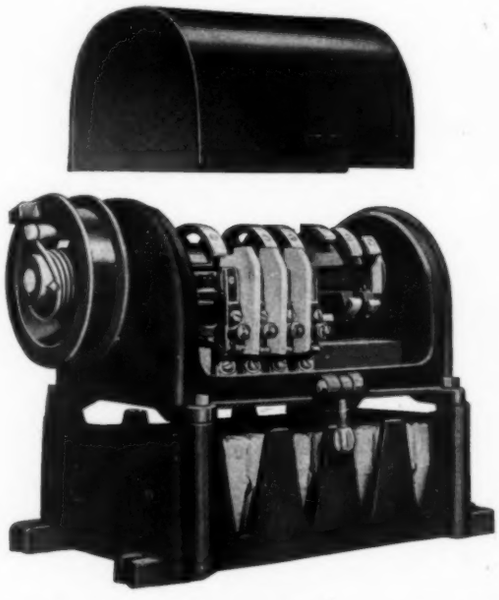
The rapidly increasing introduction of corn-popping machines, with motor-driven moving parts and electrically heated plates for keeping the butter melted for application to the corn, provides an excellent means of advertisement for electricity in its general application to household uses, besides giving the central station a constant day load for each of the machines.

The fact that these machines are publicly located—in waiting rooms, drug stores, department stores or picture-theater lobbies, gives them a wide publicity, and there is always a certain curiosity on the part of the public to be shown how the heating device is operated. The current required is about 225 watts, for machines such as are manufactured by the Holcomb & Hoke Manufacturing Company, Indianapolis, Ind.

One of these appliances is shown in the small illustration above. The small driving motor is mounted on the top of the cabinet.

New Reversible Rope-Operated Crane and Hoist Controllers.

The accompanying illustration shows a view of a new reversible drum-type controller, with inclosing cover removed, which has been designed for overhead mounting with rope operation. These controllers, which represent a new addition to the crane and hoist controller line of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., are designed for installation indoors for intermittent speed-regulating duty, such as in crane and hoist service. Two standard types are made, one giving 50 per cent speed reduction under half of full-load current and the other giving 90 per cent reduction under light-load conditions. The first type is for general crane and hoist duty, while for foundries or wherever the average load must be handled by the crane at a steady, slow speed, the controllers providing for the greater speed reduction are recommended.

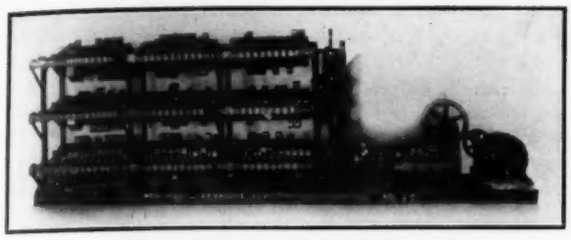


Rope-Operated Crane Controller—Usual Ceiling Mounting Is Reverse of That Shown.

Monogram-Clock Control Apparatus.

The Reynolds Electric Company, of Chicago and New York, has just completed a very intricate controller for a monogram clock built by the Gillette Electric Company for a prominent sign company in Havana, Cuba. The outfit is shown in the accompanying illustration.

The switching apparatus consists of 76 individual switches, controlling a like number of circuits in four monograms, flashing on the time of day or night. The gearing in itself is very intricate, inasmuch as there are numerous cams, one-tooth gears and Geneva movements,



Control Outfit for Monogram Clock.

as it is necessary to revolve the lower cylinder once every minute, the middle cylinder once every hour and the top cylinder once every 12 hours; accurate timing gears are therefore essential and this mechanism is built so that it will not vary a fractional part of a second. One of the two switches on the right, next to the gear housing, controls the relay, which in turn is controlled by the master clock; the other switch controls the motor circuit, the latter starting and stopping once every 60 seconds, thus making the motor duty extremely severe. The entire mechanism is built specially for this work and represents an unusual engineering feat.

Of particular interest is the motor, which is also specially designed on account of the peculiarity of duty. It is of the 220-volt, single-phase, induction type, one-sixteenth horsepower. Contrary to precedent, the motor is constructed without a cutout or starting switch, and while the windings consist of both starting and running coils, in order to eliminate any possible switch trouble due to the frequency of starting and stopping, the starter was wound so that no internal starting switch was required in the winding circuit. The starting torque of the motor was not affected by this change and there was no "arc" or "flash" caused by the opening of the ordinary centrifugal acting switch.

Portable Galvanometer with Self-Contained Lamp and Scale.

In most electrical measurement work involving the use of galvanometers of high sensibility the readings are obtained by deflection from the galvanometer mirror to a scale distant about a meter from the instrument, as a rule. The reading on the scale is obtained either by means of a telescope or by projecting a narrow band of light whose reflection from the mirror upon the scale permits a quick and accurate reading. Since the latter method is more convenient, it is particularly used for demonstration purposes and in rapid testing. In the testing departments of large manufacturing plants, however, a still more convenient arrangement is desirable.

This has been developed in a new combined portable galvanometer and lamp and scale recently put on the market by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa. As shown in Fig. 1, the instrument is very compactly built. The galvanometer is contained in the rear of the box and has a convenient zero-adjusting lever mounted so as to project above the cover. The scale forms a translucent panel in the front of the box. A convenient socket is provided at the side of the box by means of which connection is obtained with an extension cord to the lighting circuit. The general arrangement of the interior, as well as the principle of operation of the instrument, is made clear from Fig. 2. The lamp is mounted in a reflecting housing, which projects a narrow beam of light upon the galvanometer mirror from which it is reflected to the glass scale. The lamp used has a straight vertical filament of high brilliancy. It operates on 4 volts and takes about one-half ampere.

The galvanometer used is similar in construction to the portable types made by the Leeds & Northrup Company. Its moving coil is suspended. The moving system is mounted in a small metal case which fits in between the pole faces of the permanent magnet. Thus in case of damage to the suspension, the moving system may be readily removed and shipped to the factory for repair without necessitating shipping the complete instrument. These galvanometers are made with a resistance of either 200 or 20 ohms. The instruments are particularly useful where a large number of measurements is to be made in quick succession, as in a testing room.

A New Line of Electric Stoves and Ranges.

One of the oldest and now largest and best known factories for the production of all kinds of stoves and ranges is that located at Hamilton, Ohio, which has been conducting a successful business continuously since 1845. This plant of the Estate Stove Company covers many acres and includes a large number of buildings. This firm has developed the business of stove making to a high state of perfection and has attempted to keep in the lead in its design and production methods. It was natural, therefore, that when it appeared that electric stoves and ranges would come into active use, for the company to develop a department especially devoted to producing a line of electric products of this kind.

Before placing any of these electric appliances on the market, an exhaustive study was made of types of heating elements and other features connected with electric cooking so as to find forms of construction best suited for the purpose. Before deciding on a finished line, the electrical details were harmonized with the company's long experience in the manufacture of gas ranges and other types of stoves, which are built along the lines found to best suit the needs of the average

Fig. 1.—Portable Galvanometer with Lamp and Scale.

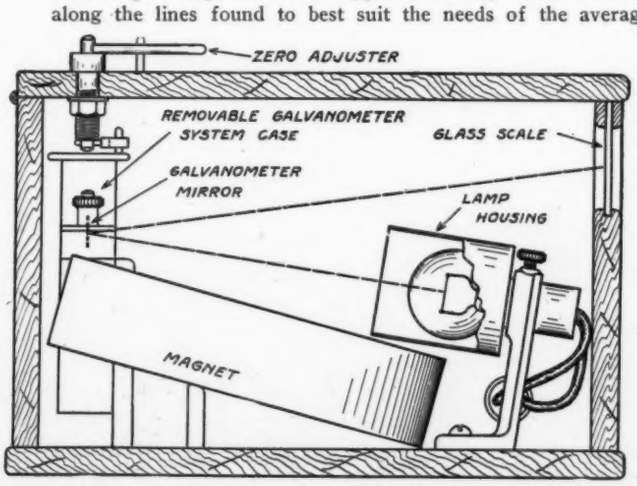


Fig. 2.—Section of Galvanometer Case, Showing Interior Arrangement.

housewife. The line of Estate electric ranges and stoves therefore contains features that are not only particularly suitable for the requirements, but are in many respects of novel construction. Several types of ranges are included in the line, also portable plate stoves, air heaters, etc.

In the construction of the oven the idea of heat insulation was carried out so as to make the use of electric oven very economical. The walls of the ovens are two inches thick and are thoroughly insulated to make the heat loss a minimum. The oven door is likewise well insulated and fits so tightly as to make the oven practically air-tight. This oven insulation is so effective that, while the temperature in the interior may be 500 degrees Fahrenheit, the outside of the oven walls is said to be not more than 50 degrees above the temperature of the room. In the oven door there is installed a thermometer which shows the actual temperature inside so as to eliminate guesswork in baking or roasting. The oven has heating plates both in the top and bottom. A single three-heat switch controls the current to these heating elements so as to give the proper heat distribution at all times. A schedule is furnished for baking and roasting in the oven; this gives the length of time that current is to be turned on before putting in different kinds of food and the time that current should be left on; as a rule the current can be cut off quite a while before the baking is done because the heat is retained by the very effective heat insulation.

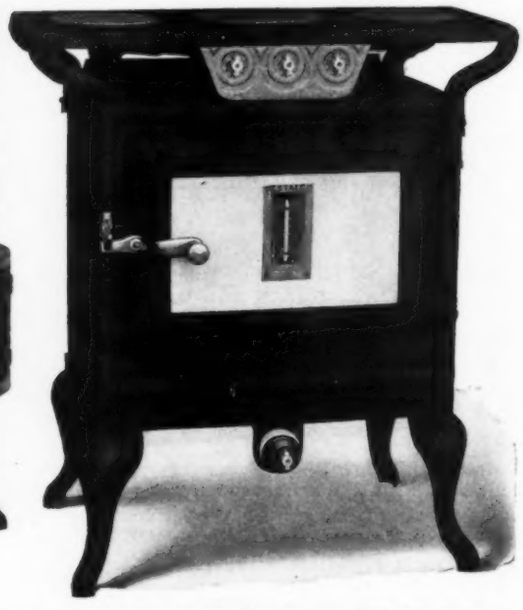


Fig. 1.—Cabinet-Type Electric Range with Two Ovens and Two Swinging Cookers. Fig. 2.—Estate Electric Range with Single Oven.

In the broiling oven a series of radiant coils is mounted in the upper portion of the compartment. Directly above these coils is an effective radiating surface so that the heat given off by the coils is projected down upon the food.

The heating plates on the surface of the range corresponding to gas burners of a gas range are either three or four in number, depending upon the size of the range. They are of the ironclad or inclosed type; this construction gives complete protection to the heating coils and gives a smooth surface for contact with the cooking vessels. Since the heating coils are entirely protected, there is no trouble from charring particles of food that may lodge among the wires in an open type construction. Each plate heating element is arranged for three degrees of heat and is controlled by a three-heat switch. Each heating plate with its self-contained unit is arranged to be easily removed; it has at the middle of the bottom three prongs that act as terminals and which fit into a porcelain receptacle; thus the heating plate needs merely to be plugged in to be ready for service. The wiring of the entire stove is readily accessable in case it is desired to inspect or repair the same.

The general arrangement of one of these ranges is shown in Fig. 1. This shows the substantial construction of the entire outfit and its clean and sanitary finish. This design corresponds to the company's popular cabinet gas range. The oven panels in the back and side of the large open cooking space are of white enamel. The cooking top is 22 by 25 inches without the side shelf, which adds 6.5 inches to the width. Three of the heating plates on the cooking top are each 6.5 inches in diameter and each takes 650 watts at high heat, 325 watts at medium heat and 165 watts at low heat. The fourth plate is 8 inches in diameter and is especially arranged for rapid work; it takes 1,200 watts at high heat, 600 and 300 watts at the lower heats. The upper or baking oven is 18 by 18 by 12 inches in dimensions and has four heating plates in the top with a total consumption of 1,500 watts at high heat. There are also four three-heat plates in the bottom with a maximum total consumption of 2,000 watts at high heat. The broiling oven has a three-heat open-coil element taking 1,500 watts at high heat. The maximum demand of the range is 8,150 watts, assuming all of the heating elements to be turned on at high heat. The probable average demand during cooking will not exceed 3,000 watts, however.

Attached to the two front legs of the range are shown two cylindrical heat-retaining cookers. These are built on the principle of an ordinary fireless cooker, but each contains an electric heating element taking 500 watts maximum. The walls of this cooker are heavily heat-insulated. Food is placed in the compartment, the cover tightly clamped on and the current turned on. After a short time the heat developed will complete the cooking operation so that the current can be shut off. In the arrangement shown in Fig. 1, these cookers can be swung under the range where they are out of the way when not in use or while the automatic cooking is going on. These cookers are an auxiliary to the range and can be obtained as

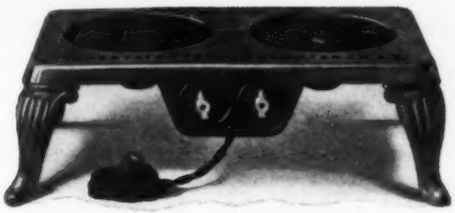


Fig. 3.—Two-Unit Portable Stove.

a separate appliance, if desired; likewise the range is obtainable with or without one or both of these special cookers.

Another form of range built particularly for small families is shown in Fig. 2. This has but one oven and three heating plates making a very compact arrangement. Two of the heating plates take 650 watts each at high heat and the third is a larger one taking 1,200 watts at high heat. The oven has two three-heat plates in the top and two at the bottom. The total wattage of the oven at high heat is 2,400 watts. The total maximum demand of the range with all elements at high heat is 4,900 watts; the probable average demand is less 2,500 watts.

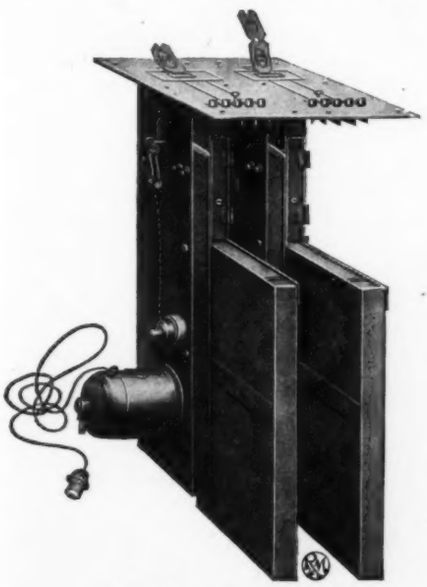
Fig. 3 shows a two-plate stove of the portable type which is provided with connecting cord and plug. Each of the heating plates is 6.5 inches in diameter and takes 650 watts at high heat, 325 and 165 watts at the medium and low heats. These portable stoves are made with one, two or three heating elements.

Electrically Operated Ticket Vender and Cash Register.

A machine for selling tickets in places of amusement, such as motion-picture theaters, is considered a necessary adjunct by many present-day proprietors. The illustration shows a machine designed to pass out tickets, registering the number sold. The apparatus can be furnished to handle from one to four kinds of tickets. Five buttons are arranged opposite each class of tickets, and by pressing No. 1 button one ticket is ejected and registered; by pressing No. 2 button two tickets are ejected, and so on.

Pressing one of the buttons sets the motor in motion, which actuates the "spider," a wheel with regularly-spaced pins on its periphery, this in turn forcing the ticket strip through the slot or opening in the top plate of the machine. When one or more tickets are issued, depending on which button is pressed, the ticket strip passes through the slot, the knife cuts off the correct number which is automatically registered. The machine is returned to its normal position and the motor circuit opened. The motor is connected to the ticket-issuing mechanism by means of a series of gears.

The motor has a rating of 0.02 horsepower and is made by the Robbins & Myers Company, Springfield, O. It is a series wound type and will operate either on direct or alternating current. The ticket selling machine is manufactured by the Automatic Ticket Selling & Cash Register Company, St. Louis, Mo.



Electric Ticket Vender.

Racine Electric Fans.

The Racine Electric Company, Racine, Wis., is this year putting out a line of electric fans of the universal type that can be used on either alternating-current or direct-current circuits of standard voltage. A few of these fans are shown in the accompanying illustrations. Fig. 1 shows a 12-inch desk and bracket fan in its wall mounting. This fan has a trunnion arrangement which permits ready adjustment of the vertical angle and change from desk to wall mounting. The swiveling arrangement is also included, by means of which the fan can be turned about a vertical axis. A similar 8-inch desk fan is also made. This is shown in Fig. 2. Each of these fans is arranged for three speeds.

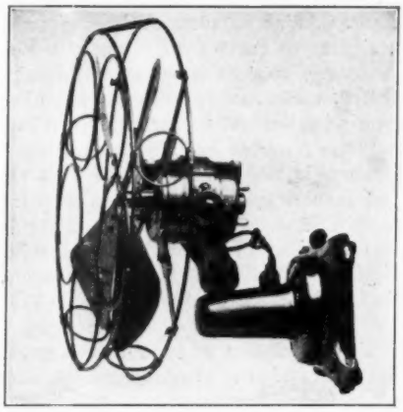


Fig. 1.—Racine 12-Inch Fan in Wall Position.

The fan shown in Fig. 3 is the company's popular table fan, which has been found especially serviceable for use in dining rooms and restaurants. It has a deflecting plate directly above the blades which serves to distribute the air laterally and thus give a cooling effect through a very large zone. The plate can also serve for placing upon it dishes of fruit, cake, ferns, flowers, or other food or plants.

Fig. 2.—Racine Eight-Inch Fan.

Fig. 3.—Racine Table Fan.

Electrical Device for Finding Flaws in Iron and Steel Castings.

An electrical device for indicating differences in the homogeneity of metals of magnetic character has, according to *The Iron Trade Review,* been developed by Ethan I. Dodds, of Pittsburgh, Pa. This apparatus is designed to record the locations of internal defects in iron and steel castings and forgings, rails, ingots, and the like. Numerous tests of the method have been made at the plant of the Union Switch & Signal Company, Swissvale, Pa.

The device consists of two small horseshoe magnets. Each magnet has a primary winding, which is energized from the secondary coil of a transformer, the primary of which is fed by an alternating-current generator. The two primary windings of the magnets are connected in multiple. The secondary winding is connected with the terminals of two electromagnets of a sound-producing device or buzzer. The two buzzer armatures are tuned so that in harmony with similar currents in the windings of the magnets, they will produce sounds of substantially the same character. Adjacent to each buzzer armature is a transmitter, similar to that of an ordinary telephone.

A small magnetic current is induced through the product to be tested, the magnets being moved along its surface. As long as the metal adjacent to each magnet is of uniform character and density, approximately the same number of magnetic lines of force will pass between the two poles of each magnet, and sounds of corresponding character will be produced at the two sound-producing instruments. If there is a defect, such as a blow-hole or pipe, the magnetic field of the magnet will be weakened to such an extent that less current will be induced in the secondary winding, thereby causing the sound-producing instrument connected with this winding to produce a sound of different character from that of the other instrument, thus enabling the operator to locate the defect. A patent is pending on an instrument developed by Mr. Dodds to register the variations in the currents.

Train-Dispatching Equipment for Texas & Pacific Railroad Company.

In the fall of 1914, the Texas & Pacific Railroad Company installed its first telephone train-dispatching circuit on a 70-mile division of its line between Fort Worth and Whitesboro. The first night after the system's installation the dispatchers started using the new circuit, and it has been in continuous service ever since.

The railroad found that a greater amount of business could be handled over the telephone than with the telegraph, and with fewer errors. Booths are installed at all sidings and spurs, so that the crews are constantly in personal touch with the dispatcher. This cuts down delays in the handling of freight, assuring faster freight service and practically eliminating the company's overtime pay roll.

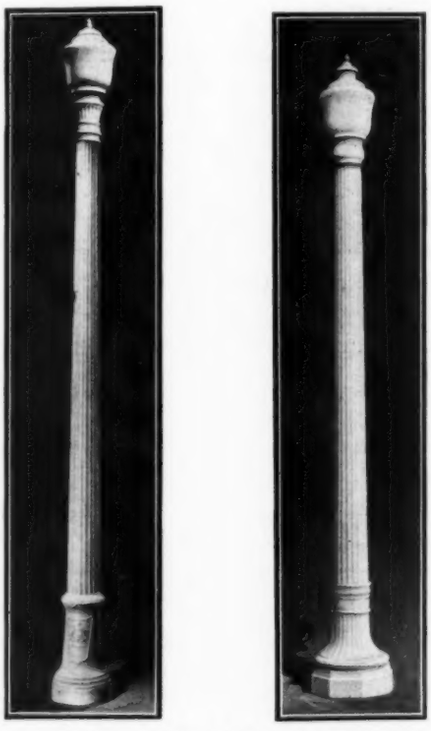
The initial installation proved so satisfactory that a 90-mile division, from New Orleans to Addis, La., was similarly equipped and put in operation last summer. On this system two circuits were installed—one for train dispatching, the other for a manual block system. Forty-eight booths were placed at sidings, spurs and stations, from any of which a conductor can ring the station either side of him, or can get in touch with the dispatcher direct.

This system, like its predecessor, has worked so satisfactorily that the railroad has given the Western Electric Company orders for full equipment, with which it will install a similar system on its Eastern division, stretching from Marshall to Fort Worth, Tex., a distance of 177 miles. This is but another step toward the complete equipping of its entire system with telephone train-dispatching apparatus.

Pressed-Steel Ornamental Lamp Standards.

Since the advent of the improved luminous or magnetite arc lamp and the gas-filled tungsten lamp a great impetus has been given to street lighting from ornamental single-light standards and a large variety of designs of these is now available. Where such standards are used on downtown business streets or on thoroughfares lined with imposing buildings, the standards likewise should be of a correspondingly massive and stately design and their construction should be such as will provide a strong post with minimum liability to danger from breakage and falling to the street in case of possible collision from runaway teams or misguided automobiles.

To meet the requirements of this and similar service, the Union Metal Manufacturing Company, Canton, O., has developed a line of pressed-steel standards, of which two typical designs are shown herewith. They are of very strong and durable construction and yet comparatively low weight. The details of the base, fluting and capitals are



Two Designs of Union Pressed-Steel Standards.

clearly brought out in the finished standard, much more so, it is claimed, than in any molded type. The base, shaft and head are furnished separately, so that it is possible to select from a relatively small number of types of these three sections combinations of great variety, resulting in exceptional flexibility of design. It is said that over 2,000 combinations can be made in this manner.

The two designs shown are equipped for Novalux Mazda type C units with two different forms of ventilating tops. The bases can be arranged for the installation of cutouts or compensators. The three parts of the post (base, shaft and head) are secured together by three steel tie rods and the whole anchored to the foundation by steel anchor rods, making a very substantial construction. In fact the manufacturer makes a very liberal 20-year guarantee to replace for a merely nominal sum, any shaft that fails in that period.

Union metal lamp standards are being marketed in the middle western states by the Minerallac Electric Company, Chicago, Ill.

INDUSTRY ACTIVITIES

Willard Doud, consulting engineer, has moved his offices to 440-5 Old Colony Building, Chicago, Ill.

The Wagner Electric Manufacturing Company, St. Louis, Mo., will increase its manufacturing quarters by the addition of a new five-story building estimated to cost $55,000.

Reliance Electric & Engineering Company, Cleveland, O., has issued a four-page folder, Bulletin No. 1013, which gives a description and specifications of the Reliance all-gear motor drive for cone-pulley lathes.

H. O. Swoboda, consulting electrical and mechanical engineer, Pittsburgh, Pa., has been retained by the Humphrey Company, Kalamazoo, Mich., for the purpose of designing an entire line of electric heaters to be manufactured by that company.

Sprague Electric Works of the General Electric Company, New York City, is distributing a 24-page booklet, Bulletin No. 49200, which illustrates, describes and gives prices of electrical devices, equipment and accessories for use in theaters. A very complete line of lights, dimmers, switchboards, fans and wiring devices is catalogued.

American Lighting Company announces the removal of its office and plant from 617 West Jackson Boulevard to 1420-1430 West Randolph Street, Chicago. Will J. Davis, Jr., president of the company, says that the demand for Nitrogen Sunlight Flood Projectors made necessary the change to larger quarters. With the increased working space, factory production is to be quadrupled.

Ward-Leonard Electric Company, Bronxville, N. Y., is making provision for additional manufacturing space to afford facilities to handle an increasing amount of business. The contract for a two-story factory building at the corner of Pearl and South Streets, Mt. Vernon, N. Y., has been placed. The building will be 83 feet by 153 feet and will follow regular mill construction lines.

The Holtzer-Cabot Electric Company which is now occupying its new building at 125 Armory Street, Roxbury, Boston, Mass., has issued invitations for an inspection of the building February 22. The new factory will house the entire business of the company, the main building being six stories, 300 by 60 feet, and containing the most modern equipment for the manufacture of the company's output.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which recently received the order for equipment for the Inland Steel Company, the largest order for electrical equipment ever placed by a steel company, has received an order from the Phillips Sheet & Tin Plate Company, Weirton, W. Va., for the complete electrical equipment of a new mill the company is building. The contract calls for two 3,000-kilowatt, three-phase, 60-cycle, 6,600-volt turboalternators; one 1,500-horsepower constant-speed alternating-current motor; one 2,500-horsepower adjustable-speed motor, and one 800-horsepower adjustable-speed motor. The speed adjustment of about 50 per cent from high speed is obtained on the 2,500 and 800-horsepower motors by means of direct-current synchronous control, a method devised by Westinghouse engineers.

Commissioners to Investigate Street Lighting Methods.—Members of the Board of Commissioners of Knoxville, Tenn., have been invited by both the Knoxville Railway & Light Company and the Knoxville Gas Company to be guests of the two companies on trips to Eastern cities to investigate methods of street lighting. The invitations were issued in order that the commissioners might be able to choose between the bids of the two companies for the contract for street lighting. The electric company has offered to light 600 6.6-ampere enclosed arc lamps at $54 a year per lamp, the old contract price having been $72.50. The gas company's price is $27 a year for a five-year contract and $24 for ten years. The commissioners desire a short-term contract. It is not believed that public sentiment would favor a gas lamp for street lighting.

The Federal Sign System.—A test of the Kansas City (Mo.) branch offices' 24-hour service was made on the occasion of President Wilson's visit to that city recently. The committee on arrangements did not decide on an electric sign for the hall until the day previous to the reception. The order was placed with the Federal Sign System, and the sign was erected above the doorway where the national executive made his appearance. The sign was masked and none except those who ordered and erected it observed it until just before Mr. Wilson entered it blazed forth the words, "Our President," in 16-inch letters. The sign was 24 feet long, illuminated with 150 10-watt lamps, colored red, white and blue. The same alphabet of 16-inch letters was used by L. P. Brintnall, the Kansas City branch manager, in an emergency order last week for a sign for the first tractor show held by the Kansas City Tractor Club.

Westinghouse Electric & Manufacturing Company.—R. L. Wilson, formerly manager of the railway division, East Pittsburgh Works, has been appointed assistant general superintendent and will be concerned directly with trades apprentices, employment, working conditions and matters of a similar nature. Mr. Wilson was born in Shelbyville, Ind., and is a graduate of Rose Polytechnic Institute of that state. He entered the employ of the Westinghouse Electric & Manufacturing Company in 1893 as a student draftsman and subsequently became inspector, engineer of construction, and later superintendent of construction, at one time being in charge of erection work in the New York district. Later Mr. Wilson was made superintendent of the railway division, which position he continues to hold. He is chairman of the joint committee appointed by the company and the employees for the settlement of differences in opinion arising between the employees and the company, and is also trustee of the Veteran Employees' Association of the Westinghouse Electric Company.

St. Louis Jovians Study National Advertising.—W. S. Donaldson, of the National Printing & Engraving Company, in his address on "Advertising," at the weekly luncheon and meeting of the St. Louis Jovian League of Electrical Interests, February 8, at the American Annex, urged that Jovians consider the subject of "National Advertising" in the electrical trade journals. Mr. Donaldson argued that the world was looking to the United States to supply its needs. "I see no reason why St. Louis should not supply the world with electrical appliances and accessories with our large manufacturing plants. I believe now is the time for St. Louis to secure a great deal of foreign business." Sidney J. Roy, Hannibal, Mo., field secretary of the National River and Harbor Congress, spoke on the question of utilizing the Mississippi River in transportation. Mr. Roy declared that it was necessary for the manufacturer and business man of the Central West to study the economic conditions surrounding their business; that the matter of water transportation was a great economic problem.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

HEATERS, Electric.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Electric ranges and hot plates.

Catalog Nos. 2-18, 3-18, Automatic, 2-18, 3-18, Non-Automatic, 3-18R and L, Special Automatic, 21, 22, 31. 11.7 kilowatts or less, 110-220 volts.

Note.—In installation of these devices it is considered desirable, from standpoint of safety to persons, that framework be permanently and securely grounded, a soldering lug being provided on device for this purpose. The same protection of surrounding materials should be observed in installation of this device as is applied to stoves of other types used commonly for cooking.

Listed January 17, 1916.

OUTLET BUSHINGS AND FITTINGS, Couplings.—Dodson Patent Union Fittings, 511 Granger Block, San Diego, Cal.

Malleable iron galvanized coupling for rigid conduit.

Listed January 12, 1916.

PICTURE MACHINES AND APPLIANCES.—Nicholas Power Company, 90 Gold Street, New York, N. Y.

Rheostat for use with arc lamp of moving picture machine, 25-45 amperes, 110 volts. Iron grids enclosed in perforated metal case with lever and contacts for varying resistance in circuit.

The general design and construction of this rheostat are acceptable under present standards. It should, nevertheless, be noted that any device of this character will, even under normal current, reach temperatures making it necessary to take special care to avoid installation near combustible material or in a manner which will not afford entire protection against the ignition of moving picture films which may come in contact with the rheostat under conditions liable to obtain in practice.

Note.—It is recommended that for the safety of persons the exposed non-current carrying metal case of this appliance be permanently and effectively grounded.

Listed January 5, 1916.

RECEPTACLES, For Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins "Spartan."

Conduit Box, 10 amperes, 250 volts, catalog No. 113.

Listed December 29, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Keyless, back-connected receptacles, composition shell, 660 watts, 250 volts, catalog No. 24998. Standard for use only on switchboards.

Listed January 5, 1916.

RECEPTACLES, Standard.—Weber Electric Company, Schenectady, N. Y.

Porcelain Shell.

Keyless, 660 watts, 250 volts, catalog Nos. 4024-26 inclusive.

Listed January 3, 1916.

ROSETTES, Fuseless.—Weber Electric Company, Schenectady, N. Y.

Three amperes, 250 volts. Cleat, catalog No. 2003. Concealed, catalog No.

Cleat Rosette No. 2003.—Weber Electric Company.

2002. Combined cleat and concealed, catalog No. 2006. Molding, catalog No. 2004, 2005.

Listed November 22, 1915.

RUBBER-COVERED FIXTURE WIRE.—The Bay State Insulated Wire & Cable Company, Hyde Park, Mass.

Marking: One black thread running with wire between rubber insulation and braid.

Listed January 7, 1916.

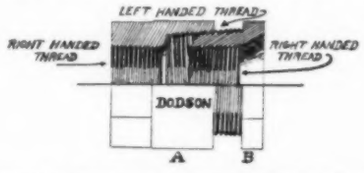
RUBBER-COVERED FIXTURE WIRE.—Boston Insulated Wire & Cable Company, Hamilton, Ont.

Marking: One coarse uncolored thread woven in a clockwise direction. direction.

Listed January 7, 1916.

RUBBER-COVERED FIXTURE WIRE.—Lowell Insulated Wire Company, Lowell, Mass.

Marking: Two yellow threads running parallel with wire between rubber insulation and braid.



Conduit Coupling.—Dodson Patent Union Fittings.

Listed January 7, 1916.

RUBBER-COVERED FIXTURE WIRE.—The Whitney-Blake Company, New Haven, Conn.

Marking: White paper strip extending length of conductor under braid next to rubber insulation, marked "W. B. Co."

Listed January 8, 1916.

SIGNS, Electric.—Electric Display Sign Company, 118 North Eighth Street, Richmond, Va.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters have label attached.

Listed December 23, 1915.

SOCKETS, Candelabra and Miniature.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins," 75 watts, 125 volts.

Candelabra. For candle fixtures, catalog No. 540.

Listed December 29, 1916.

SOCKETS, Candelabra and Miniature. — Weber Electric Company, Schnectady, N. Y.

Weber 75 watts, 125 volts.

Candelabra. Keyless. For candle fixtures, catalog Nos. 2052, 2054.

Miniature. Keyless. For candle fixtures, catalog Nos. 2051, 2053.

Listed January 5, 1916.

SOCKETS, Standard.—General Electric Company, Schenectady, N. Y.

Porcelain shell. Key, 660 watts, 250 volts, catalog Nos. GE567-569, inclusive.

Standard for use only in places where not exposed to hard usage.

Listed January 11, 1916.

SWITCHES, Automatic. — Haynes Manufacturing Works, Chicago, Ill.

Automatic time switch.

This device consists of a cast-iron case inclosing an eight-day, twenty-four-hour clock mechanism, arranged to operate a standard double-pole or two-circuit snap switch. Haynes 2-10 amperes, 250 volts.

Listed November 8, 1915.

SWITCH BOXES.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Sherardized and enameled pressed-steel switch boxes in single and gang types. National.

Catalog Nos. 4120, 4130, 4150, 4220, 4230, 4250, 4320, 4330, 4350, 4420, 4430, 4450.

Listed December 20, 1915.

SWITCHES, Door.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Single-pole, 3 amperes, 250 volts, 6 amperes, 125 volts, Pullman Berth Switch, catalog No. 51.

Listed January 5, 1916.

PERSONAL AND BIOGRAPHICAL

MR. A. M. BIBLE, formerly purchasing agent for several eastern railroads, has been appointed temporary chief of the Bureau of Lighting, Philadelphia, Pa.

MR. C. A. HASCALL was re-elected president of the Fallon (Mo.) Electric Railway Company at the annual meeting of the company recently. Mr. E. S. Berney was re-elected general manager.

MR. R. C. COFFY, manager of the Everett Gas Company, Everett, Wash., has been appointed a member of the program committee of the Northwest Electric Light & Power Association which will convene in Seattle in September.

MR. L. H. KINNARD, vice-president and general manager or the Bell Telephone Company of Pennsylvania and Associated Companies, gave an address on "He Serves His Company Best Who Best Serves the Public" at a meeting of the Telephone Society of New York, February 15, in the United Engineering Building, New York City.

MR. F. E. McCALL, formerly electric vehicle engineer with the Commonwealth Edison Company, Chicago, has accepted a position as battery sales engineer in the Chicago offices of the Philadelphia Storage Battery Company. Mr. McCall is secretary-treasurer of the Electric Vehicle Association of America, the present being his second term in office.

MR. WILLARD W. LOW, president of the Electric Appliance Company, Chicago, is back at his desk and rapidly regaining his usual robust health, after a second operation within the year. Mr. Low, accompanied by Mrs. Low, will leave Chicago on February 19, going directly to Del Monte, Cal., where he will stay until March 8. From March 8 to March 21 he will visit the officers of the branch company at San Francisco, and March 22 to March 27 will rest at Glenwood Mission, Riverside, Cal. The Electric Appliance Company at Dallas, Tex., will be visited from March 30 to April 6, and the company at New Orleans from April 7 to April 13. Mr. Low expects to be back in Chicago on April 14 or 15.

OBITUARY.

MR. G. S. SHANKLIN, president of the Fayette Home Telephone and prominent in business circles of Lexington, Ky., dropped dead in his office recently, aged 56 years.

MR. D. A. CHAPPELL, of Riverside, Cal., president of the Nevada-California Electric Corporation, died Feb. 9, in Denver, Colo. Death was caused by pneumonia following an accident incurred several weeks ago.

MR. FREDERICK BUCHERER, one of the pioneer salesmen in the electrical field, died February 7 after a short illness. Mr. Bucherer had been a salesman for the Diehl Manufacturing Company, Elizabeth, N. J., for 22 years and was well known throughout the New York electrical jobbing and contracting trade.

MR. GEORGE A. MACBETH, president of the Macbeth-Evans Glass Company, Pittsburgh, Pa., died February 11 at his home in that city, aged 71 years. Mr. Macbeth was engaged in the glass business for 50 years, and was perhaps the most thorough master of glass manufacture in this country, developing its use for many commercial, mechanical and electrical purposes, and was consulted by scientists from all over the world. He was one of the original trustees of the Carnegie Foundation.

MR. BELVIDERE BROOKS, who began as a messenger boy for the Western Union Telegraph Company in 1871 and advanced to the position of general manager in 1910 and vice-president since January, 1913, died suddenly of heart failure at his home.

Belvidere Brooks.

116 Riverside Drive, New York City, in his fifty-sixth year. Although Mr. Brooks had not been in good health for several months, he had not been absent often from his office. When he was 12 years old Mr. Brooks was a messenger boy in Wheelock, Texas, where he was born. A year later he had mastered the Morse code and became a telegraph operator, the youngest operator known to the business. After serving as manager at various offices he was appointed assistant superintendent at Denver, Colo., and in 1902 he was transferred to New York as general superintendent of the eastern division.

During the period of Mr. Brooks' general management of the company he was identified with some of the recent and important changes and development of its affairs, including the affiliation arrangement with the American Telephone & Telegraph Company, the grouping of the business under six general divisions, and the plan of the company decided upon last December for the pensioning of its employees. He had a great practical knowledge of the telegraph business, dating back 45 years, during which he had served in every executive capacity Aside from his able accomplishments and efficiency he was one of the most popular officials ever connected with the Western Union, possessing an exceedingly generous and whole-souled personality that enabled him to make many friends and which equipped him naturally to judge men and to handle them with fairness and justice.

Mr. Brooks was an officer and director in a number of subsidiary companies of the Western Union and other concerns in which he had private interests. He was a member of the New York Athletic Club and other organizations.

Mr. Brooks is survived by four sons, Gerald, Belvidere, Jr., George B., and Joseph Brooks, and a brother, Joseph W. Brooks, traffic superintendent of the Western Union Telegraph Company at Dallas, Tex.

MR. J. J. SCHAYER, formerly manager of the Electric Shop, Chicago, and well known among men of the electrical trade, died in New York February 4 from a complication of grip and pneumonia. Mr. Schayer was born in Boston in 1865. Coming to Chicago in 1893 he entered the contract department of the old Chicago Edison Company and occupied important positions with that company and the Commonwealth Edison Company for a period of 17 years. He was manager of the Electric Shop during 1909 and 1910 and did much to build up the business of that store. He was manager of the first Chicago Electrical Show, in 1906. Since 1910 Mr. Schayer has been a manufacturers' agent in eastern territory, and he was in New York when taken ill.

MR. DENNIS J. HERN, former superintendent of Street Lighting of Boston, died February 7 at his home in that city. He was a native of Boston and 61 years old. At the age of ten he entered the employ of the United States Telegraph Company as a messenger boy. Rising through the positions of line repairer, battery boy and operator, he became inspector of the city line department of the Atlantic & Pacific Telegraph Company. In 1875 Mr. Hern became manager of the Boston office, and two years later was made superintendent of the lines between Boston and New York. In 1879 he became superintendent of the Mutual Union Telegraph Company, in charge of lines between Bangor, Maine, and New York. At the same time, he was general manager of the Eastern Telegraph Company and of the Mutual District Messenger Company of Boston. In 1902 he left the telegraph business to become commissioner of health of the Port of Boston and after a four-year term was appointed superintendent of street lighting of that city. During recent years he has engaged in the advertising business. The deceased was well known throughout the country by telegraph men. His early service brought him in touch with Thomas A. Edison, and he assisted Alexander Graham Bell in his first experiments with the telephone.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

BAR HARBOR, ME.—The Bar Harbor & Union River Power Company is mapping out a system of street lighting for this community. Vice-President E. R. Graham and a lighting expert have been looking over the situation.

ST. ALBANS, VT.—The holdings of the Vermont Power & Manuafcturing Company have been purchased by the Public Electric Lighting Company, a Massachusetts operating company, of which W. R. Dame, Clinton, Mass., is one of the directors. The company is making extensive plans for the future and may extend its lines to Highgate Springs and Essex Junction.

FALL RIVER, MASS.—The committee on street lights has been authorized to make a new contract with the Fall River Electric Light Company. Additional lights will be installed.

HOLYOKE, MASS.—The Park Board probably will receive an appropriation of $2,500 for an installation of electric lights in Prospect Park.

TURNERS FALLS, MASS.—A second circuit and new power transmission line from this place to Amherst is soon to be built by the Turners Falls Power & Electric Company, work to begin as soon as material for the line is on the ground. The route of the present transmission line will be followed. The work will be in charge of H. D. Seavey, Greenfield, superintendent of distribution.

CENTRAL FALLS, R. I.—The question of a municipal lighting plant for the city is being discussed by interested citizens.

BERLIN, CONN.—The Connecticut Power Company, New London, Conn., proposes to construct a steam generating station at Cromwell and to extend its transmission lines from Berlin to Cromwell and thence to Middletown.

NEW BRITAIN, CONN.—The Board of Public Works is making plans for providing a white way for New Britain at a cost of about $6,000.

NEW LONDON, CONN.—Work on the construction of the new power house of the Shore Line Electric Company has started. The station will supply power for the company's trolley line between this city and Norwich.

BUFFALO, N. Y.—According to statements of President E. G. Connette of the International Railway, the capacity of the company's power system will be increased 9,000 kilowatts, at a cost of about $175,000. One item is the equipment of the five substations with additional machinery, including seven 1,000-kilowatt rotary converters. Power will be carried from Niagara Falls to these substations by 500,000-circular-mil cables.

FULTON, N. Y.—Announcement has been made by J. J. Jordon, general manager of the Fulton Light, Heat & Power Company, that plans had been completed for a transmission line from this city to Phoenix.

NEWBURGH, N. Y.—An extension of the Orange County Traction Company's line is to be constructed on Lake street, if plans now under way materialize.

NIAGARA FALLS, N. Y.—Hugh L. Cooper, who was engineer in charge of the construction of the power plant of the Electrical Department Company, Niagara Falls, Ont., and Harry Kornfeld, who represents large financial interests in New York, are organizing a force of engineers to make a survey of the lower river with a view of promoting a power development scheme in the lower river. The plan proposed is similar to that of the Lower River Power Company, incorporated some years ago, but never developed.

PORTLAND, N. Y.—The Niagara & Erie Power Company will soon start erecting poles preparatory to furnishing the entire town of Portland with electricity. Heretofore the village of Brocton only has been furnished power by this company.

JERSEY CITY, N. J.—The Public Service Corporation of New Jersey has acquired a plot of ground adjacent to one of its substations here, ostensibly for the purpose of making additions.

BEAVER FALLS, PA., Charters have been granted for lighting companies in South Beaver, Little Beaver, Coverdale, New Galilee, Cannelton, Big Beaver and Darlington. The offices of the lighting company probably will be located with those of the Beaver County Light Company in Beaver Falls.

BUTLER, PA.—R. E. Sprenkle and others have formed the Adams Light Company to furnish electrical energy for lighting in Adams Township, Butler County.

CHRISTIANA, PA.—A new silk mill to cost over $50,000 will be erected here in the near future, the mill to be operated entirely by electricity. Address the Businessmen's Association here.

FALMOUTH, PA.—The York Haven Electric Power Company, which recently extended its lines to Bainbridge, will build lines to Billmeyer and Falmouth.

HAZELTON, PA.—The council will soon make arrangements for the installation of an electric street lighting system.

RENOVO, PA.—A new motor-generator set is being installed in the power house of the Edison Light, Heat & Power Company of Renovo. Improvements to the extent of $30,000 will soon be completed at the plant.

CUMBERLAND, MD.—The City Council will make an expenditure of about $20,000 for improvements to the city electric lighting plant.

FREDERICK, MD.—The aldermen passed a resolution asking the State Public Service Commission for authority to manufacture and sell electric power in Frederick.

CLARKSVILLE, VA.—Bonds for the establishment of an electric lighting plant here will be issued.

NASHVILLE, N. C.—A $10,000 electric light plant may be established here. A. L. T. Vaughan is city clerk.

FORT MILL, S. C.—Mayor E. C. Patterson and citizens are considering the feasibility of installing a municipal electric light plant.

FAIRBURN, GA.—The Fairburn Electric Railway Company, which operates between College Park and Fairburn, will replace its present cars, which are operated with gasoline, by storage battery cars. The company will invest $50,000.

PINEORA, GA.—The Atlantic Engineering Company, Germania Bank Building, Savannah, Ga., is doing the engineering work for the electric lighting plant in which W. L. Gignilliatt is interested.

PLANT CITY, FLA.—The Mayor and interested citizens contemplate buying or building an electric lighting plant.

NORTH CENTRAL STATES.

CHILLICOTHE, O.—The Board of Education may decide to install a power plant to supply energy for its own use.

COLUMBUS, O.—The Columbus Railway and Light Company was authorized by the Public Utilities Commission of this state to issue $225,000 worth of bonds, most of the proceeds from which will be used for extensions this year. P. V. Burington is general manager of the company.

HAMILTON, O.—The proposition of completing the cluster light contract on the west side, which calls for the extension of the lights from B to D Streets, will soon be taken up by the West Side Commercial Association.

ANDERSON, IND.—An ordinance asking an appropriation of $105,000 for improvements at the municipal light plant has been drafted and will be presented to the City Council. The money is distributed as follows in the appropriation measure: Storage binds and track trussel, $5,000; traveling crane, monorail and grab bucket, $7,000; structural iron, $5,000; crusher, hopper, bucket elevator and motor, and steel chute for conveying coal, $7,500; wire for constructing heavy feed lines to all parts of the city, $15,000; three new boilers, $15,000; building for boilers, $2,500; steam lines and fittings, $500; stack, $8,000, and turbogenerator, $40,000.

CRAWFORDSVILLE, IND.—Plans for additional facilities for the city lighting plant have been submitted to City Engineer Cragwall by Superintendent Miller.

PALMYRA, IND.—L. A. Kahl has purchased machinery for an electric lighting power station here from the General Electric Company and will install it immediately to provide local service.

BASCO, ILL.—The Basco Electric Light & Power Company has been incorporated with a capital of $5,000 by August Ancelet, W. C. Fisher and others.

CARROLTON, ILL.—Mayor Redd has plans for a municipal lighting plant under consideration.

GALESBURG, ILL.—According to Superintendent Carley, the Galesburg Railway, Lighting & Power Company will spend about $225,000 in improvements of various kinds in this city.

LIBERTY, ILL.—S. G. Lawless and others have organized the Liberty Electric Company, with a capital stock of $2,500. The company will build a power plant and furnish energy for lighting and power.

MENDON, ILL.—The Mendon Electric Light & Power Company has been incorporated to furnish electric light and power in this city. The company's capital stock is $5,000, and the incorporators are J. A. Thompson and others.

PITTSFIELD, ILL.—Substations belonging to Central Illinois Public Company at Pittsfield, Maysville, Griggsville, New Salem and Bayliss in Pike County, were either totally or partially destroyed by fire recently. The cost of making the necessary repairs and rebuilding is estimated at $20,000.

SPRINGFIELD, ILL.—The City Council has taken up the matter of providing an ornamental lighting system on Monroe and Washington streets with A. D. Mackle, general manager of the Springfield Utilities Company.

GRAND LEDGE, MICH.—The Consumers Power Company has material on the site of the building it will erect here at a cost of $7,000. The basement will be used for machinery and the first floor for offices and electrical appliance display. The company is building a dam and generating station on the Ausable River.

GRAND RAPIDS, MICH.—The Central West Improvement Association will consider a proposition for new boulevard lights on certain streets in its district at an annual meeting to be held soon.

CRIVITZ, WIS.—Residents of this community are making plans for securing an electric lighting plant.

SHEBOYGAN, WIS.—The Sheboygan Railway and Electric Company is planning to extend its interurban line from Elkhart Lake through Kiel and New Holstein to Chilton, a distance of 19 miles. Edward Hammett is general manager.

DAWSON, MINN.—The new power plant at Minnesota Falls will be completed in a month. It will increase the capacity of the Falls from 400 to 1700 horsepower. Next summer the company will build a steam plant at Montevideo of 2,000-horsepower capacity.

GILBERT, MINN.—A lighting system is proposed for this community.

NORTH REDWOOD, MINN.—Outside capitalists have secured the water rights for the erection of a power plant on the Minnesota River near here.

MINNEAPOLIS, MINN.—M. L. Lane, commercial superintendent of the Northwestern Telephone Exchange Company, made a statement recently that provision

has been made for an outlay for improvements that will approximate $10,000,000 to be spread over a period of years. The directors recently authorized an increase of the capital stock from $15,000,000 to $25,000,000.

ST. CLOUD, MINN.—The St. Cloud Public Service Company is contemplating extensive additions to its hydro-electric power plant. A. J. Bemis is general manager.

ST. PETER, MINN.—The City Council has closed a contract with the Consumers Power Company of Mankato, Minn., for furnishing electrical energy for street and commercial lighting and power in this city.

WINONA, MINN.—Announcement has been made that the Wisconsin Railway, Light & Power Company, operating public utilities in Winona and LaCrosse and supplying a large number of towns in this section, will erect a new and modern steam reserve station in Winona, to take the place of the present emergency plant here. The proposed new plant, which will be equipped with the latest machinery, will cost $200,000. R. M. Howard is general manager of the company.

COLUMBUS JUNCTION, IOWA.—A. L. Lundquist and R. L. Van Meter have purchased the electric light plant here from E. N. Miller. Mr. Lundquist will be manager.

DENISON, IOWA.—Having installed an electric lighting plant the City Council is now taking up the matter of extending the lines to Arion and Vail, two adjoining towns.

DES MOINES, IOWA.—The City Council is considering means for lighting Polk Boulevard. A steel-post electrolier system is being advocated by W. L. Drake, P. L. Clancey and others.

NEW HAMPTON, IOWA.—F. A. Schuet, A. D. McKinley and W. W. Murray have been granted a franchise to erect, maintain and operate an electric transmission line on public highways in this vicinity.

OELWEIN, IOWA.—The Fayette County Utilities Company contemplates the extension of its transmission line from here to Hazelton.

OSKALOOSA, IOWA.—Plans are being considered for the installation of a power plant to be put in by the Oskaloosa Vitrified Brick Company.

VINTON, IOWA.—Plans are being considered by the Iowa Railway & Lighting Company to extend its transmission line from Vinton to Shellsburg, Benton County, and to Reinbeck, Grundy County.

BLUE SPRINGS, MO.—The Council may install an electric lighting plant here.

LUCERNE, MO.—The Lucerne Electric Light Company has been incorporated with a capital of $3,200 by S. L. Prough, O. E. Snyder and others.

CHERRYVALE, KANS.—The Kansas Gas and Electric Company, of Wichita, is contemplating improvements to its plant. C. Hill is local manager.

HUTCHINSON, KANS.—A proposition has been submitted to the City Commission by the United Water, Gas & Electric Company, which will make a reduction in the present street lighting rate in the city and make possible the extension of white way lights on North Main Street.

KANSAS CITY, KANS.—The Commissioners have voted to purchase a 3,000-kilowatt generator for the municipal lighting plant. This additional equipment will give the plant a capacity of 12,000 kilowatts.

McPHERSON, KANS.—Plans are being considered for improvements and extensions to the local lighting plant. A generating unit, voltage regulator and other equipment will be purchased. Arthur Groesbeck is manager.

OAKLAND, KANS.—At a meeting of the Mayor and Council of the city an ordinance was drawn which provides for the lighting of all of the streets in the city. The Mayor is authorized to make a contract with the Topeka Edison Company to furnish the city proper lighting of the streets and highways for a period of ten years, and give the company a 20-year franchise.

ROSSVILLE, KANS.—E. J. Steckel & Son, of Dwight, Kans., have been granted a franchise to furnish light and power to this city. An oil engine and generating equipment will be installed, to be in operation by March 15. The company will be known as the Rossville Light & Power Company. Transmission lines to nearby towns probably will be built.

OMAHA, NEB.—The City Council committee is considering the plan of electric street lighting submitted by the City Electrician recently, which provides for 800 additional lights. The plan contemplates the adoption of a new style 400-candlepower light and the maintenance of an ornamental system for the downtown district.

DATES AHEAD.

Illinois State Electric Association. Annual convention, Champaign, Ill., February 23-24. Secretary, H. E. Chubbuck, Peoria, Ill.

American Physical Society. Regular meeting, Fayerweather Hall, Columbia University, New York City, February 26. Secretary, A. D. Cole, Columbus, O.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 9-11. Secretary, R. B. Fowles, Pine Bluff, Ark.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thomson, Jr., Des Moines, Iowa.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

ALCESTER, S. D.—This city has voted $10,000 to secure an electric lighting system.

HURLEY, S. D.—Voters here have approved a proposition for the establishment of an electric lighting plant, $10,000 being voted for the purpose.

WHITE, S. D.—George Blaisdell, owner of the White electric light plant, has disposed of the same to Charles Hillyer and H. Moore, Jr. The new owners are planning on the installation of a 60-horsepower oil engine and a generator in the spring.

WILLISTON, N. D.—The construction of a white way lighting system for Williston is now an assured fact, the work to be done during the coming summer by Edward Link of this city, who was awarded the contract.

SOUTH CENTRAL STATES.

FLEMINGSBURG, KY.—Owners of the local electric light plant are considering changing the plant over from a direct to an alternating-current system. D. Bankel, electrical engineer, of Cincinnati, has been in Flemingsburg making estimates as to the cost of such alterations.

GLASGOW, KY.—An increase of $25,000, raising it to $75,000, has been made in the capital stock of the Glasgow Electric Light & Ice Company. The company will make improvements.

HAZARD, KY.—The Kentucky River Power Company has taken over the Hazard Power Company from L. L. Stone and associates of Pikeville.

LEXINGTON, KY.—The City Commission is making an inspection of the streets to determine whether to meet the requests of citizens for additional street lights.

BIRMINGHAM, ALA.—The Board of Commissioners has authorized the City Engineer to investigate the feasibility of erecting an electric light plant in Idlewild Park.

GADSDEN, ALA.—A municipal electric lighting system may be the issue in the coming municipal campaign. More than a year ago agitation in favor of building a municipal plant was started, but the matter was dropped.

NEWPORT, ARK.—The Arkansas Light and Power Company or Arkadelphia, Ark., contemplates constructing a power plant and installing new equipment, including engines, generator and switchboard.

MIAMI, OKLA.—The sale of the Oklahoma, Kansas & Missouri Interurban Railway has been made to Kansas City capitalists. George Rice was selected as general manager. The road operates btween Miami and Commerce, and does practically all of the freight business in the Miami mining district. The road probably will be extended to Picher and Cardin.

OKLAHOMA CITY, OKLA.—A campaign for the installation of a white way system on business streets is being launched by merchants here.

TEXHOMA, OKLA.—The City Board will build a larger building and will install larger and better generating equipment. The present facilities have become inadequate, present demands upon the system necessitating improvements and extensions.

DALLAS, TEX.—Consolidation of the four traction companies in Dallas, all of which are operated under the control of the Stone & Webster Engineering Corporation, is pending. The companies embraced in the plan are the Rapid Transit Company, the Metropolitan Street Railway Company, the Northern Texas Traction Company, and the Consolidated Street Railway Company. Improvements will be made when the consolidation is effected.

DALLAS, TEX.—The Texas Traction Company and the Southern Traction Company, both of Dallas, will be consolidated under one management. The Texas Traction Company operates an interurban electric line between Dallas and Denison, and the Southern Traction Company operates similar lines between Dallas and Waco and between Dallas and Corsicana. The total interurban milage of the two companies is 230. J. F. Strickland is president of both companies. An extension of the Southern Traction Company's line from Waco south to San Antonio via Austin, a distance of about 185 miles, will be started soon.

TERRELL, TEX.—The City Commission has extended the time limit of the franchise which was granted the Stone & Webster Engineering Corporation for the construction of an interurban electric railway upon certain streets of Terrell until April 20, 1917.

WESTERN STATES.

CASCADE, MONT.—It is reported the contract for lighting city streets has been awarded to the Great Falls Power Company, which will install 30 250-candlepower nitrogen-filled lamps.

LIBBY, MONT.—New steam machinery to replace the machinery now run by water power will soon be installed by the Libby Electric Light Works & Power Company, according to H. E. Robinson, manager.

ALAMOGORDO, N. M.—The Board of Trustees has under consideration plans for constructing a municipal electric light and power plant.

CARLSBAD, N. M.—The Public Utilities Company will install new machinery in the local electric light and water works plant to cost about $10,000. A. J. Muzzy is president.

SILVER CITY, N. M.—The Silver City Light & Power Company has let the contract for another power unit. The cost of the new engine and generator will be $20,000.

FLORENCE, ARIZ.—F. A. Tackeray, agent at the Pima Indian Reservation, has announced that a right of way across the reservation for the extension of the Roosevelt power line to connect with the state prison and Florence will be granted. The route for the line has already been surveyed.

GARDNERVILLE, NEV.—The power plant of the Douglas Company, near this city, will soon be enlarged to double the present capacity.

ALBION, IDAHO.—The United States Government has approved a contract with this city which provides for the construction of a transmission line from the pumping plant of the Minidoka tract to Albion for the distribution of power.

PAUL, IDAHO.—The Paul Electric Company has filed an application with the Public Utilities Commission for permission to build a power system.

PASCO, WASH.—The proposition of developing a power and irrigation project which will bring water to 73,500 acres of land near this city, same to include the construction of a 40-foot dam on the Snake River at Five Mile Rapids and make possible the development of 40,000 horsepower the year around, and the ultimate development of 80,000 horsepower for ten months in the year, is being promulgated by the Chamber of Commerce, of which A. J. Elrod, is president. The Chamber of Commerce recently engaged E. G. Hopson, Portland, Ore., consulting engineer of the United States Reclamation Service, to make preliminary investigations, reports and esti-

mates. Construction costs are estimated roughly at $52 to $57 per acre; operation and maintenance $2 per acre. Surplus power could be sold for $10 per horsepower at the plant, and it is claimed profit sufficient to entirely absorb operation and maintenance charges of the system could be made. Preliminary plans state the dam to be constructed will be provided with canal and locks on the south side of the Snake River. The water would completely submerge both Five Mile and Fishhook Rapids, thereby rendering the Snake River navigable throughout the year as far as Lewiston, Idaho. A portion of the stream flowing through turbines would operate powerful pumps, forcing the water through four lines of pipe, against heads of 80, 140, 205 and 275 feet, discharging into four independent canals, each supplying a network of laterals, delivering the water to each 40-acre tract.

SEATTLE, WASH.—A franchise to extend the lines of the municipal lighting and power plant over and along certain county roads in the southern part of King County has been granted by King County Commissioners. It is understood the municipal plant will begin construction in the territory as soon as the capacity of the plant is increased.

SEATTLE, WASH.—Passage of a Council bill, declaring it the intention of the city of Seattle to investigate the Sauk-Suiattle power site, with a view to early development, has been recommended by the Finance Committee of the Council. The bill also appropriates $2,000 for water meters to test the flow of water at the site.

WALLA WALLA, WASH.—An avalanche recently destroyed 60 feet of the Pacific Power & Light Company's flume on the Walla Walla River near that city, placing the plant, which supplies Walla Walla with energy for light and power, totally out of commission. Street cars were forced to discontinue operation and the streets were left in darkness. The small steam auxiliary plant in this city cared for the residence lighting business.

WINONA, WASH.—Plans are being made here for the establishment of an electric lighting system.

BAY CITY, ORE.—It is reported the Coast Electric Power Company proposes purchasing and enlarging the local power plant and system.

HOOD RIVER, ORE.—The Farmers Irrigating Company has appointed a committee to finance the development of a valuable power site on Hood River, owned by the company. Chairman J. T. Jeffrey reports the development of the project will begin at an early date.

HOOD RIVER, ORE.—The property of the Hydroelectric Company in this city has been sold to the Pacific Power & Light Company, which operates numerous plants in Oregon and eastern Washington. The reported price is $186,000. The latter company has filed in the District Federal Court a suit to enjoin the East Fork Irrigation District of Hood River from interfering with the power company's riparian rights for five miles along the Hood River. The Pacific Power & Light Company, in it complaint, alleges that its investment in the East Fork Irrigation District is $600,000, and that it will be damaged to the extent of $100,000.

PORTLAND, ORE.—Bids for furnishing materials and installing a lighting system in Holladay Park, including the furnishing of 8,000 feet of electric cable, will shortly be called for by Purchasing Agent Wood.

LOS ANGELES, CAL.—Chief Electrician Scattergood has presented specifications to the Public Service Commission calling for equipment, including 4,000 cedar poles, to be used in the extension of the municipal lighting system.

MARE ISLAND, CAL.—Mare Island will soon have an electric railroad that will join the industrial center with the magazine grounds, if Lieutenant J. W. W. Cumming, outside superintendent of the machinery department, and other officials at the local station can secure the approval of the plan of the Bureau of Yards and Docks.

PERRIS, CAL.—The Southern Sierra Power Company has been awarded the contract for installing additional lights in this city.

RIVERSIDE, CAL.—The Pacific Electric Railway has been granted a franchise for a single-track electric railroad spur at Magnolia Avenue and Myers Street, work of construction to commence within three months.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company is prosecuting condemnation suits in Placer, Sacramento, San Joaquin and Solano counties for right of way for its proposed new tower line, which is to extend from Auburn to San Francisco Bay.

SAN FRANCISCO, CAL.—The Board of Supervisors has endorsed the proposed system of lighting San Francisco's principal streets. The Finance Committee, however, has refused to appropriate more than $10,000 as the city's share of the expense. The Downtown Association, which is responsible for the campaign for better lights on Market Street, asked that the supervisors appropriate at least $14,000 of the $23,194 necessary for the installation and upkeep of the new system. The merchants will start a campaign for the raising of more funds and will meet with the Finance Committee again after another effort has been made to raise the money.

New Incorporations

LANGLEY, WASH.—Whidby Electric Company. Capital, $50,000. Incorporators: H. E. Wood and others.

BROOKLYN, N. Y.—Rubes Electric Devices, Inc. Capital, $100,000. Incorporators: Nicholas Rubes and others.

NEW YORK, N. Y.—Habirshaw Electric Cable Company. Capital, $925,000. Incorporators: E. W. Moore, J. W. Murphy and J. B. Guargglia.

YONKERS, N. Y.—Barlow Electrical Specialties Company. Capital, $10,000. Incorporators: W. N. Barlow, M. E. Blauvelt and C. W. Boote.

BANTAM, CONN.—The Trumbull-Vanderpool Electric Manufacturing Company has increased its capital stock $22,000, making a total of $92,000.

CANTON, O.—The Edward E. Early Company. Capital, $10,000. Dealing in electrical supplies. Incorporators: E. E. Early, M. A. Early and others.

COLUMBUS, O.—The Enzor-Hoel Company. Capital, $25,000. Dealing in gas and electrical supplies. Incorporators: F. K. Enzor, R. E. Hutchinson and others.

NEW YORK, N. Y.—Wilson Electric Devices Company. Capital, $10,000. Incorporators: D. H. Wilson, A. M. Lovibond and M. C. Dobson, all of New York City.

CHICAGO, ILL.—Anderson Electric Specialty Company. Capital, $5,000. Manufacture electrical devices. Incorporators: W. L. Hall, C. E. Burnap and C. O. Shervey. Z.

BROOKLYN, N. Y.—The Erickson Automatic Electric Water Purifier Company. Capital, $75,000. Incorporators: G. E. Erickson, C. E. Peterson and Frederick Teden.

INDIANAPOLIS, IND.—Electric Controller Company. Capital, $40,000. Manufacture electrical controllers. Incorporators: H. E. Welchel, J. J. Turner and W. E. Munk.

NEW YORK, N. Y.—The Electrical Publication's Syndicate. Capital, $10,000. Publish papers devoted to electrical industry. Incorporators: Ralph Neumuller, Irving Crumb and J. A. Fitz Randolph.

DUBUQUE, IOWA.—The Alamo Farm Light Plant Dubuque Company. Capital, $10,000. Manufacturing electric lighting plants and accessories. Incorporators: B. J. Schwind, A. G. Jaeger and B. J. Schwind, Jr.

BOSTON, MASS.—Choralcelo Company of Massachusetts. Capital $10,000. Manufacture electrically-operated musical instruments, motors, batteries and appliances. Incorporators: W. E. Farrington and G. E. Hills, Brookline, and E. F. Dunlop, Boston.

Financial Notes

The Georgia Railway & Light Company, of Atlanta, which recently held its annual meeting, reported that net earnings for the year were $212,466. P. S. Arkwright was re-elected president; G. W. Brine, vice-president and general manager; W. H. Glenn, vice-president and operating manager.

The Portland (Ore.) Railway, Light & Power Company has a total investment in Portland of $59,350,464, according to its quarterly report which shows the operating revenue of the street-car system to have been $790,425 and the operating expenses $483,892. Lighting revenue was $590,228, with expenses amounting to $143,409.

The California Railroad Commission has issued an order authorizing the Northern California Power Company to enter into an agreement with the holders of its $670,000 of series A debentures dated February 1, 1912, or more than three-fourths of the holders thereof, providing a postponement of the maturing of these debentures from February 1, 1916, to February 1, 1920. The bonds are to bear interest at 6 per cent and the agreement is that the power company shall pay monthly $5,000 on account of principal.

The Northern States Power Company has increased its capital stock from $17,500,000 to $30,000,000, and also has filed a change in name of the Consumers Power Company of Minnesota, its principal subsidiary, to Northern States Power Company. The increase in the capital stock will be used to retire the present stocks of subsidiary corporations, and when this is completed steps can be taken to put into effect a complete reorganization. With this completed, the way will be opened for the payment of dividends on the common stock, on which the company is now earning in excess of 12 per cent.

National Carbon Company had another highly successful twelve months in the fiscal year to December 31. The balance of profits was equal to between 18 per cent and 20 per cent on the $9,965,500 common stock. In 1914 the common shareholders were given a 50-per-cent stock dividend, while during the same period further issuance of new common was made to absorb the balance of the Ever Ready Company, not previously owned. If National Carbon earns 20 per cent for its common, it will have a surplus above dividends and the usual depreciation charge of approximately $900,000, bringing its surplus item up to $2,000,000, or over 20 per cent for the common.

The Manhattan Railway Company has advertised for direct sale to the public $4,523,000 second-mortgage 4-per-cent bonds, due June 1, 2013. The issue is made under a second mortgage for $5,409,000, which was authorized by the New York Public Service Commission on February 3, but which was arranged for in the lease, which the Manhattan Railway Company made of its property to the Interborough Rapid Transit Company on January 1, 1903. Under this lease the Interborough, besides paying annual rent to the Manhattan Railway Company of $10,000 and undertaking to meet the interest on its stocks and bonds, was to have the right at any time after July 1, 1908, to call upon the Manhattan Railway Company to issue a new series of bonds to the amount of $5,409,000, which were to be secured by a mortgage covering either all or a part of the Manhattan Railway Company's franchises, rights, privileges, and property. The proceeds of these bonds were to be used to repay the money expended by the Inter-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 14.	Feb. 7.
American Tel. & Tel. (New York)	127⅝	126⅞
Commonwealth Edison (Chicago)	144¼	144¾
Edison Electric Illuminating (Boston)	246	244
Electric Storage Battery common (Philadelphia)	65⅜	63
Electric Storage Battery preferred (Philadelphia)	65⅜	63
General Electric (New York)	171⅜	170½
Kings County Electric (New York)	128	128
Massachusetts Electric common (Boston)	7½	6
Massachusetts Electric preferred (Boston)	40	36¼
National Carbon common (Chicago)	182	179
National Carbon preferred (Chicago)	122	—
New England Telephone (Boston)	137	135¾
Philadelphia Electric (Philadelphia)	27⅞	28
Postal Telegraph and Cables common (New York)	87¾	81½
Postal Telegraph and Cables preferred (New York)	67½	66
Western Union (New York)	89¼	87⅞
Westinghouse common (New York)	67⅝	66
Westinghouse preferred (New York)	77	76

borough in improvements of the Manhattan Company's tracks.

Dividends.

	Term	Rate	Payable
Am. Tel. & Cable	Q	1.25%	Mar. 1
Cent. Ark. Ry. & Lt. Corp., pf.	Q	1.75%	Mar. 1
Cent. Miss. Val. Elec. Prop., pf.	Q	1.5 %	Mar. 1

Reports of Earnings.

CONTINENTAL GAS & ELECTRIC.

Continental Gas & Electric Corporation reports for the fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$566,589	$550,330
Expenses and taxes	361,996	352,867
Net earnings	204,593	197,463
Interest charges	85,330	70,315
Surplus	119,263	127,148

While the business of the subsidiaries of the companies increased materially in 1915, reductions in rates cut down the revenue to some extent, and the earnings for the year do not reflect the real expansion of the company. In 1915 the company expended $223,370 for extensions and additions, and $50,000 for acquisition of additional properties.

CITIES SERVICE.

	1915	1914
December gross	$532,195	$404,807
Net after expenses	514,407	392,763
Surplus after charges	473,573	351,930
Balance after preferred dividends	342,731	221,097
12 months' gross	4,479,800	3,934,453
Net after expense	4,306,944	3,817,545
Surplus after charges	3,816,944	3,397,545
Balance after preferred dividends	2,246,939	1,761,552

Proposals

ELECTRICAL WORK.—Bids will be received until February 29 for the complete electrical work to be done in the new Mosser School Building, Allentown, Pa. T. P. Wenner is secretary of the Board of Education. Runyon & Carey, 845 Broad Street, Newark, N. J., are the engineers and Ruhe & Lange, Allentown, Pa., are the architects.

GENERATOR AND ENGINE.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., March 1, 1916, for a new engine and generator in the United States postoffice and courthouse at Philadelphia, Pa. Specifications may be obtained from the custodian of the building, Philadelphia, Pa., or at the Supervising Architect's office.

LIGHTING FIXTURES.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m. March 23, 1916, for the mechanical equipment (except elevators) and lighting fixtures of the United States customhouse, appraisers' stores, and courthouse, Wilmington, N. C., in accordance with drawings and specifications, copies of which may be obtained from the custodian of the site at Wilmington, N. C., or at the Supervising Architect's office.

Electrical Patents Issued February 8, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,170,519. **Lamp.** D. H. Elkins, assignor to Gray & Davis, Boston, Mass. Details of automobile headlight body.

1,170,526. **Apparatus for Purifying Air.** W. H. Gaither, Pittsburgh, Pa. Comprises fan for centrifugally separating dust at mouth of reflector containing lamp, together with means for absorbing carbon dioxid and moisture.

1,170,545. **Signaling Device for Apparatus for Stopping Vehicles.** J. J. Keenan, assignor to M. A. Keenan, New York, N. Y. For signaling from one station to another along roadway.

1,170,552. **Means for Producing Alternating Current by Cathode-Ray Tubes.** A. Meissner, assignor to Gesellschaft Fuer Drahtlose Telegraphie M. B. H., Berlin, Germany. Receiving arrangement for sustained high-frequency electric oscillations.

1,170,556. **Keyboard Apparatus.** D. Murray, assignor to Western Union Telegraph Co., New York, N. Y. For telegraph instruments.

1,170,557. **Toy Telegraph Sounder.** J. S. Newman, Cleveland, Ohio. Structure of solenoid frame.

1,170,566. **Panelboard.** F. F. Skeel, assignor to Crouse-Hinds Co., Syracuse, N. Y. For three-wire system. (See cut, next page.)

1,170,596. **Reflector Connection.** L. W. Anderson, assignor to Plume and Atwood Mfg. Co., Waterbury, Conn. For securing to lamp socket.

1,170,599. **Pendant Switch.** R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Details of device having pivoted tilting operating member at bottom.

1,170,607. **Electric Measuring Instrument for Iron-Loss Testing.** L. W. Chubb, assignor to Westinghouse Electric Mfg. Co., E. Pittsburgh, Pa. Comprises relatively movable, mutually reacting coils.

1,170,608. **Method and Means for Testing Electrical Apparatus.** L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. For testing inductive apparatus.

1,170,613. **Signaling System.** G. Crosby, New York, N. Y. Automatic starting signal for cars at starting station.

1,170,614. **Apparatus for Regulating the Temperature of Fluids.** H. Darwin and C. C. Mason, assignors to Taylor Instrument Co., Rochester, N. Y. For maintaining constant temperature by electro-thermostatically controlling mixture of fluids of different temperatures.

1,170,615. **Safety Manipulating Device for Machinery.** W. W. Dean, assignor to Benjamin Electric Mfg. Co. Hands of operator, kept out of danger by requiring both to manipulate switches controlling trip solenoid of press.

1,170,618. **Induction Motor.** A. M. Dudley, assignor to Westinghouse Electric & Mfg. Co. Winding for polyphase, multi-speed motors.

1,170,620. **Vapor Rectifier.** S. W. Farnsworth, assignor to Westinghouse Electric & Mfg. Co. Container for vapor-electric apparatus.

1,170,657. **Alternating-Current Commutator-Motor.** F. W. Meyer, assignor to Westinghouse Electric & Mfg. Co. Inductively related lap and wave stator windings, one adjustably connected to brushes bearing an armature commutator and other to supply source.

1,170,670. **Electromagnetic Relay.** E. A. Reinke, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Special compact structure for telephone use.

1,170,680. **Selective Wireless-Telegraph Apparatus.** F. G. Sargent, Westford, Mass. Sending of radio signals accompanied by lighting of appropriate annunciator lamps.

1,170,689. **Rectifier-Anode.** E. F. Sipher, assignor to Westinghouse Electric & Mfg. Co. Details of hollow electrode for mercury vapor apparatus.

1,170,690. **Electric Conduit Fitting.** F. F. Skeel, assignor to Crouse-Hinds Co., Syracuse, N. Y. Box with socket fittings and globe support.

1,170,718. **Ceiling-Light Hanger.** J. Williamson, assignor to R. Williamson & Co., Chicago, Ill. Attachment to junction box.

1,170,723. **Strain Insulator.** C. N. Allerding, assignor to Ohio Brass Co., Mansfield, Ohio. Details.

1,170,725. **Wire Clamp.** A. O. Austin, assignor to Ohio Brass Co. Adjustable suspension clamp.

1,170,727. **Apparatus for Regulating the Temperature of Furnaces and the Like.** R. E. Baker, Cleveland, O., assignor to A. G. McKee. Thermoelectric.

1,170,728. **Circuit Controller.** T. E. Barnum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Manual and automatic device with movable contacts and normally stationary contacts movable to break circuit at any position of movable member.

1,170,731. **Voting Machine.** W. J. Bohan, St. Paul, Minn., and W. E. Johnston, Sacramento, Cal. Electromagnetic vote-registering devices.

1,170,738. **Circuit Controller.** H. H. Cutler and F. S. Wilhoit, Milwaukee, Wis. Controls motor and magnetic clutches for variable speeds.

1,170,751. **Rail Bond.** A. B. Herrick, assignor to Electric Railway Improvement Co., Cleveland, O. Special structure of bond terminal and electrode to facilitate electric welding.

1,170,789. **Train-Stopping Apparatus.** J. F. Webb, Sr., and J. F. Webb, Jr., assignors to International Signal Co., New York, N. Y. Track-operated, electrically controlled air brake.

1,170,796. **Electromagnetic Telegraph-Key.** R. L. Boulter, Los Angeles, Cal. Vibratory instrument having electromagnetically controlled vibrator.

1,170,811. **Electrical Resistance.** C. E. Hay, Ilford, and H. W. Sullivan, London, Eng. Formed of insulated conductors arranged so that induction is neutralized by capacity.

1,170,819. **Galvanic Cell.** M. L. Kaplan, assignor to Beacon Miniature Electric Co., New York, N. Y. A depolarizing material comprising discrete particles of graphite ccated with higher oxid of manganese.

1,170,840. **Tension-Regulating Mechanism for Printing Presses and the Like.** W. S. Morse, Philadelphia, Pa. Brakes on paper rolls electrically controlled by web tension.

1,170,853. **Signaling Apparatus.** H. Shoemaker, assignor to Marconi Wireless Telegraph Co., Jersey City, N. J. Solid and fluid dielectrics alternately inserted between spark-gap electrodes to clear out heated gases and regulate sparking.

1,170,881. **Wireless Receiving System.** L. DeForest and C. Logwood, assignors to Radio Telephone & Telegraph Co., New York, N. Y. Audion arrangement.

1,170,882. **Automatic Switching Device for Telephone Systems.** L. DeForest, New York, N. Y. Radio-telephone system; voice-controlled means for connecting transmitter with antenna.

1,170,907. **Protective Liquid-Dispensing System.** H. Hillebrand, N. Y. Electric indicating and recording device for beer spigot.

1,170,909. **Automatic Telephone System.** D. S. Hulfish, assignor to Canadian Independent Telephone Co., Toronto, Can. Arrangement of relays, contacts, indicators, etc., for two-movement selector switch.

1,170,920. **Insulating Joint.** L. McCarty, Boston, Mass. Flanged, tubular, threaded members secured together in insulated relation.

1,170,924. **Master-Controlled System of Electric-Light Wiring.** I. L. Matson, assignor to K. M. Gair, Boston, Mass. Lamps controlled by individual switches and also a master switch.

1,170,943. **Electric Heating Element.** H. O. Swoboda, assignor to Moffat Stove Co., of Weston, Ontario, Can. Two continuous resistors are strung back and forth across an open center frame in alternation with each other.

1,170,946. **Electric Rat and Animal Trap.** O. Weiss, Salt Lake City, Utah, assignor of one-half to W. Sunday, Salt Lake City, Utah. Platform has conducting sections connected in circuit when platform descends under weight of animal.

1,170,951. **Cover-Locking Device.** J. Anderson, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. For railway motor covers.

1,170,954. **Direction Indicator for Vehicles.** H. H. Broyer, G. Cambeilh and J. Papale, San Francisco, Cal. Arm has lamp at pivot and another at tip which is lighted when arm is horizontal and extinguished when vertical.

1,170,959. **Marine Lamp and Electric Connection.** A. S. Campbell, Medford, Mass. Special plug and socket for connector for ship's light.

1,170,969. **Means of Transmitting Intelligence.** R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Wireless telegraphy; signals transmitted by altering continuous stream of cycles of impulses.

1,170,974. **System of Motor Control.** S. H. Keefer, assignor to Niles-Bement-Pond Co., Jersey City, N. J. Motor-reversing system.

1,170,990. **Inclosed Switch Construction.** C. D. Platt, Bridgeport, Conn. Combination of switch, casing and cover adapted to have box lock closed and switch open. (See cut, next page.)

1,170,996. **Retaining Mechanism.** O. A. Ross and H. B. Taylor, assignors to General Railway Signal Co., Gates, N. Y. Special arrangement of electric motors for railway signals.

1,171,002. **Electric Hand-Lamp.** G. A. Soehnlein, Brooklyn, N. Y. Attachment for dry cell.

1,171,013. **Screwless Electric-Shade Holder.** L. W. Andersen, Waterbury, Conn.

Shade support detachably connected to socket canopy.

1,171,021. Speedometer. A. A. Canton, New York, N. Y., assignor to Device Testing Co. Indicator is inductively operated by rotating magnetic field; temperature compensation is provided.

1,171,042. Alarm. J. J. Greytak, Great Falls, Mont. Details of circuit-closer.

1,171,052. Internal-Combustion Engine. E. B. Jones, Hornell, N. Y., assignor of one-third to E. B. Kreason, Hornell, N. Y. Special spark-plug mounting.

1,171,055. Engine-Starting, Lighting and Ignition System. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Special system comprising storage battery and motor-generator starting and then driven by engine.

1,171,059. Resistance Unit for Electrical Apparatus. A. J. Loguin, Petrograd, Russia. Helically wound coil with convolutions elongated and circumferentially displaced.

1,171,088. Alarm System for Fire-Escapes. D. E. Burkhart, Spokane, Wash. Use of escape closes alarm circuit.

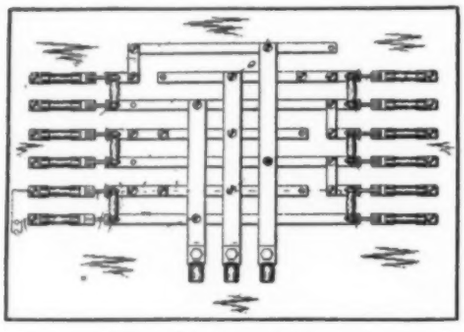
1,171,104. Electric Heater. H. W. Denhard, assignor to Cutler-Hammer Co., Milwaukee, Wis. Distribution of heat storage in sad iron.

1,171,109. Car-Controlling Apparatus. W. C. Dust, St. Louis, Mo. Intercontrol of air brake driving motor, sander and trip fender.

1,171,117. Process and Apparatus for the Electric Firing of Materials and Ores. W. H. Hampton, assignor to Conley Electric Furnace Co., Wilmington, Del. Comprises subjecting the ore to electrically heated air-blast.

1,171,126. Insulator Pin. J. G. S. Lindholm and A. P. Lindholm, Chicago, Ill. Divided sheet-metal shell.

1,171,127. Metallic Cross Arm Pin. J. G. S. Lindholm, assignor to A. P. Lindholm.



No. 1,170,566.—Panelboard.

Formed of a plurality of channeled sheet-metal sections.

1,171,129. Fire-Alarm System. J. McFell, Chicago, Ill. Arrangement of alarm boxes and circuits.

1,171,130. Synchronous Converter. S. H. Martin, Chicago, Ill. Has combination of squirrel-cage and form windings on magnetic screen between field and armature.

1,171,134. Dynamo-Electric Machine. A. H. Neuland, Burgenfield, N. J. Rotating field within stator and driven magnetic member between stator and field.

1,171,142. Ground Connection for Electrical Conductors. D. Rosen, Philadelphia, Pa. Clamp for attaching to pipes, etc.

1,171,145. Carburetor. J. Sachs, Hartford, Conn. Primer for explosive engines has electric heat for vaporizing chamber, and admission valve for chamber controlled by common circuit.

1,171,148. Method of Forming Armature Coils. J. C. Simonsen, assignor to Chalmers Motor Co., Detroit, Mich. Wound in open spiral and then telescoped.

1,171,151. Quick-Break Switch. P. Sorenson, New York, N. Y. Two push-button, oscillatory device.

1,171,166. Lightning Arrester. L. S. Brach, New York, N. Y. High resistance and adjustable spark-gap in parallel between line and ground.

1,171,171. Adjustable Electric Lamp. R. D. Chandler, Spiceland, Ind. Bracket for incandescent lamp, pivoted for vertical and horizontal adjustment.

1,171,180. Electric-Lamp Socket. V. R. Despard, Chicago, Ill. For mounting in sign board.

1,171,190. Fan. G. H. Graves, Chicago, Ill., assignor of one-half to H. M. Campbell, Chicago, Ill. Has coin-controlled motor.

1,171,192. Explosion Indicator for Internal-Combustion Engines. C. T. Haas, Tucumcari, N. M. Indicator circuit controlled by exhaust.

1,171,193. Arc Lamp. C. A. B. Halvorson, and J. T. Beechlyn, assignors to General Electric Co. Schenectady, N. Y. Maintains main and auxiliary electrodes, having different rates of consumption, in proper relationship throughout their consumption.

1,171,208. Voltage Regulation. L. B. Jones, Kansas City, Mo. Operating electromagnet has provision for compensating for change in temperature of coil.

1,171,213. Electrical Instrument. O. A. Knopp, Oakland, Cal. For measuring current; magnetic effect of current is automatically neutralized and neutralizing current noted.

1,171,237. Automobile Headlight. G. Pelham, Lead, S. D., assignor of one-half to Chambers Kellar, Lead, S. D. Special two-way, centering switch.

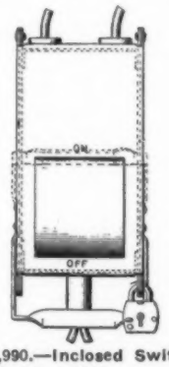
1,171,254. Temperature-Regulating System. E. H. Ruckle, assignor to Hughes Electric Heating Co., Chicago, Ill. Circuit of heating element thermostatically controlled by series of concatenated relays of different current capacities.

1,171,255. Treatment of Ores. O. C. Rudolph, assignor to Otto Stalmann, Salt Lake City, Utah. Treatment for ores having volatile constituents, such as lead, zinc, etc., comprises fusing by passing electric current through charge without reducing it.

1,171,258. Electric Heater. S. Schneider, assignor to General Electric Co. Electric stove has oven formed between two separable plates of high heat-storage capacity.

1,171,267. Insulator for Electrically Charged Wires. G. B. Smith, Arlington, Md. Tubular insulator with special metal-gripping strip.

1,171,270. Automatic Switch for Controlling the Operation of Pumps. K. Sorge, New York, N. Y. Particular pressure-operated controller for compression motor.



No. 1,170,990.—Inclosed Switch Construction.

1,171,271. Arc-Lamp Clutch. R. G. Standerwick, assignor to General Electric Co. Details of electrode-adjusting mechanism.

1,171,272. Oil Switch. G. Stern, assignor to General Electric Co. Has air chamber above oil divided to prevent spread of ignition of explosive gases.

1,17,274. Portable Electric Lamp. J. L. Strauss, assignor to Rose Strauss Co., New York, N. Y. Lamp standard rotatably mounted on base provided with cord reel, contacts, etc.

1,171,279. Electrolytic Meter. J. N. Tuttle, assignor to General Electric Co. Has mercury anode and finely woven silk diaphragm, preventing passage of mercury to cathode, except electrolytically, but permitting return of mercury deposited at cathode.

1,171,284. Street Indicator. H. W. Vernson, Blue Rapids, and H. F. Lutz, Lawrence, Kan. For electric trolley systems; electromagnetically controlled bank of sign cards.

1,171,291. System of Remote Control. J. D. Williamson, assignor to American Engineering Co., Philadelphia, Pa. Relates to electromagnetic reversing-switch mechanism.

1,171,332. Train Signaling and Control System. T. M. Freeble, Rochester, Pa. Block system having brake valve controlled by track circuit and speed conditions.

1,171,333. Safety Apparatus for Railways. T. M. Freeble. Modification of above.

1,171,334. Combination Fixture Insulator. C. H. Gaffney, Medford, Mass. Details of compressed fibre structure for securing fixture to outlet box.

1,171,338. Safety Device. H. G. Hillman, assignor to J. T. Clarke, New York, N. Y. Door circuits for elevators.

1,171,351. Apparatus for Transmitting Power. A. H. Neuland, San Francisco, Cal., assignor to Neuland Electrical Co., New York. Arrangement of stationary member and two rotatable magnetic members held in synchronism by magnetism.

1,171,352. Dynamo-Electric Machine. A. H. Neuland, assignor to Neuland Electrical Co. Commutating, inductor machine.

1,171,366. Motor. W. F. Straub and A. R. Radtke, Chicago, Ill. Armature moves step-by-step in response to successive energization of surrounding magnets.

1,171,374 and 1,171,375. Starting Mechanism for Automobiles. C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. First patent: Starting motor has longitudinally movable armature to shift gear and variable number of field poles. Second patent: Modification.

1,171,379. Printing Telegraph Receiver. J. E. Wright, Pittsburgh, Pa. Mechanism for operating type wheel.

1,171,396. Margin-Regulating Mechanism for Web Rolls. G. S. Williamson and C. E. Mandelick, assignors to Publishers Utilities Co., New York, N. Y. Mechanism for controlling motor for shifting roll spindle axially.

1,171,399. Electrical System. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Apparatus for changing the form-factor of a peaked voltage wave.

Reissue 14,060. Attachment for Installing Magnetos on Gas Engines. W. G. Swift, assignor to Splitdorf Electrical Co., Newark, N. J. Original No. 1,107,374. Dated Aug. 18, 1914. Magneto driving connection for "Ford" engines.

PATENTS EXPIRED.

The following United States electrical patents expired on February 14, 1916:

619,269. Electrical Transmission of Sound. F. M. Bell, New York, N. Y.

619,276. Signal-Recording Apparatus. W. L. Candee, New York, N. Y.

619,287. Electric Railway. J. B. Entz, Philadelphia, Pa.

619,293. Prepayment Electric-Fan Motor. W. C. Fish and F. P. Cox, Lynn, Mass.

619,296. Dynamo-Electric Machine. S. S. Forster, Schenectady, N. Y.

619,299. Retaining Band for Commutators. J. R. Grindrod, Lynn, Mass.

619,302. Two-Rate Meter. C. D. Haskins, Newton, Mass.

619,307. Electric Motor. T. D. and F. W. Hollick, London, Eng.

619,314. Electric Heater. C. W. Jones, North Temescal, Cal.

619,316. Trolley Catcher and Retainer. W. B. King, Willoughby, O.

619,320. Trolley. C. W. Larson, Schenectady, N. Y.

619,324. Battery Switch. R. Macrae, Jersey City, N. J.

619,349. Process of and Apparatus for Extracting Precious Metals from Ores or Slimes. H. Riecken, London, Eng.

619,360. Insulating Alternating-Current Circuits. C. P. Steinmetz, Schenectady, N. Y.

619,410. Telegraph-Key Attachment. A. J. Hendricks, Crockett, N. Y.

619,440. Duplex Faradic Battery. J. H. Robertson, New York, N. Y.

619,448. Electric Burglar Alarm. J. Tomney, New York, N. Y.

619,449. Electric Protective System. J. Tomney, New York, N. Y.

619,465. Electric Switch. A. Brier, Manchester, Eng.

619,471. Electric Branding Device. E. Fellowes and H. Van Hoevenbergh, New York, N. Y.

619,476. Mechanical Time Switch for Two-Rate Electric Meters. J. H. Gerry, New York, N. Y.

619,493. Telephone Attachment. F. Lind, Jr., Paterson, N. J.

619,519. Electric Branding Device. H. Van Hoevenbergh, New York, N. Y.

619,527. Motor Vehicle. C. E. Woods, Chicago, Ill.

619,555. Telegraph Insulator. I B. Frantz, Allenport, Pa.

619,618. Ships or Similar Compass. L. Rellstab, Kiel, Germany.

619,620. Electric Motor. C. L. Rosenquist, New York, N. Y.

619,621. Alternating-Current Electric Motor. C. L. Rosenquist, New York, N. Y.

619,622. Secondary Battery. A. Schanschieff, London, Eng.

619,632. Indicating and Recording Mechanism for Measuring Fluids in Motors, etc. J. E. Thebaud, Buffalo, N. Y.

619,636. Apparatus for Separating Magnetic Materials. O. A. P. Trustedt, Stockholm, Sweden.

619,662. Telephone-Signaling System. D. M. Bliss, Brookline, Mass.

619,667. Electric Printing Machine. G. L. Campbell, Dushore, Pa.

619,679. Galvanometer. A. A. Dittmar, Jersey City, N. J.

619,687. Electrical Sign. W. A. Harvey, Scranton, Pa.